



PREVALENCE OF RED CELL ALLOIMMUNIZATION IN REPEATEDLY TRANSFUSED PATIENTS WITH B- THALASSEMIA IN SOLAPUR DISTRICT, MAHARASHTRA STATE, INDIA.

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Key words: Alloimmunization, Red-Cell Antibodies, Beta Thalassemia, Splenectomy

Abstract :

β -major-thalassemia is a congenital hemolytic anemia caused by defects in β -globin chain synthesis. The globin chain that is produced in excess is responsible for the ineffective erythropoiesis and shortened red blood cell (RBC) survival. The present study includes the prevalence of red cell alloimmunization in repeatedly transfused patients with β -Thalassemia in Solapur District, Maharashtra, India. A cross-sectional descriptive study was conducted over one year period from January 2010 to December 2010 at Smt. Gopabai Damani Blood Bank (Indian Red Cross Society) Solapur, Maharashtra, India. A total of 74 Thalassemia patients receiving multiple blood transfusions at intervals of 2 to 4 weeks, or who had received at least 20 transfusions, were included in this study. The diagnosis of Thalassemia was confirmed by patient's standard hemoglobin electrophoresis Reports Clinical transfusion records of 74 Thalassemia patients who fulfilled the criteria were analyzed for the presence of alloimmunization, their antibody specificity and the time interval of RBC immunization from start of transfusion. Ethnic background, status of splenectomy, age at start of transfusion and the number of blood units received were also recorded.

Laboratory investigations using standard blood bank methods, serum was analyzed prior to each transfusion to detect new antibodies to RBC antigens. All pre transfusion sera were also tested to determine their phenotype for the following blood group systems: ABO; Rhesus (D, C, E, c, and e); Kell (K, k), Kidd (Kpa, Kpb) and Duffy (Fya, Fyb). Clinical and laboratory data were collected and analyzed to find out the frequency, pattern and factors influencing red cell immunization secondary to multiple blood transfusions in these patients.

Introduction:

Alloimmunity is a condition in which the body gains immunity, from another individual of the same species, against the foreign cells. Antibodies must be identified in the recipient's serum before each transfusion so that compatible blood can be provided. Several factors might have contributed to this finding, such as the heterogeneity of the population, the difference in the number of studied patients, the differences in age at first transfusion, antigenic differences between the blood donor and the recipient; the recipient's immune status; and immunomodulatory effects of the allogenic blood transfusions on the recipient's immune system and splenectomy. In 1989 Walker *et al.*, pointed out the Alloimmunization by blood transfusion. Sirchia *et al.*, (1995)



studied the Red cell alloantibodies in thalassemia major patients. Blumberg and Gettings (2003) find out that the WBC reduction of RBC transfusions is associated with decreased incidence of RBC alloimmunization. With the growing knowledge of the immune effects of current blood transfusions and limited data on the immune status of Thalassemia patients, a large study addressing the complex interaction of these factors is needed. Khalid Hassan and coauthors were found out the red cell alloimmunization in repeatedly transfused Thalassemia Major Patients in Pakistan. Red cell alloimmunization in routinely transfused patients of beta thalassemia major was studied by Gupta *et al.*, (2010). The present study was undertaken to estimate the incidence of allo-immunization in multiply transfused thalassemics and to evaluate factors which may influence the development of antibodies

Material and Methods:

A cross-sectional descriptive study of antibody screening was conducted over one year period from January 2010 to December 2010 at Smt. Gopabai Damani Blood Bank (Indian Red Cross Society) Solapur, Maharashtra, India.

All pretransfusion sera were also tested to determine their phenotype for the following blood group systems: ABO; Rhesus (D, C, E, c, and e); Kell (K, k), Kidd (Kpa, Kpb) and Duffy (Fya, Fyb). An antigen panel was used for the antibody screening procedure, where the serum was mixed with saline suspended red cells in LISS Coombs gel card incubated at 37°C for 15 minutes. Antibody screening at 4°C, 22°C and 37°C was carried out in a saline phase, by indirect antiglobulin technique (IAT), using papain cystein, low ionic strength solution (LISS) and polyethylene glycol (PEG).

Results:

A total of 74 patients were included in the study. 31 (31.82 %) patients were females and 43 (22.94%) males. The age of patients was ranged from 3 to 18 years. They had regular blood transfusions during periods ranging from 3 to 18 years. The interval between blood transfusions was 18-30 days.

Present study investigated 74 cases of multiply transfused thalassemia major patients for development of alloantibodies against red cells by indirect antiglobulin test, using 3-red cell panel, and when required 11-red cell panel. Anti-red cell alloantibodies were detected in 01 (0.74) patients, in male 01 (0.43%) and in female 00 (0.00%) patients. Demographic data of alloimmunization patients have been shown in table 1. The results shows that the prevalence percent of splenectomy in males 04 (1.72%) and in females 03 (0.93). All 74 patients with alloimmunization were treated with prednisone, intravenous immunoglobulin and cyclosporine A. Beside the above drugs; azathioprine was used for three of them.

Table-1 Sex specific red cell alloimmunization positivity prevalence percentage

Sex	Total No.	Thalassemia Major (%)	Thalassemia Intermediate (%)	Thalassemia a Minor (%)	Splenectomy (Prevalence %)	Red cell alloimmunization (Prevalence %)
Male	43	25 (10.75)	13 (5.59)	05 (2.15)	04 (1.72)	01 (0.43)
Female	31	21(6.51)	06 (1.86)	04 (1.24)	03 (0.93)	00 (0.00)
Patients (Male + Female)	74	46 (30.04)	19 (14.06)	09 (6.66)	07 (5.18)	01 (0.74)



Discussion:

This is a study about red cell alloimmunization rate among β -major-Thalassemia patients on regular blood transfusion. Post-storage leukodepleted blood was used for transfusion. It is not a standard practice in our center to give phenotype-matched red cells to patients with thalassemia. The use of phenotypematched blood is given only in patients who have developed alloantibodies. Red blood cell alloimmunization was found in 01 (0.74) patients. Our patients were treated with immunosuppressive drugs including prednisone, intravenous immunoglobulin, cyclosporine A and azathioprine and now all of them are in healthy condition. Khalid Hassan *et al.* (2004) observed that the Red cell alloimmunization in repeatedly transfused Thalassemia Major patients in Pakistan, in British Thompson *et al.* (2011) studied the Red cell alloimmunization in a diverse population of transfused patients with thalassaemia. Walker *et al.* (1989) observed the alloimmunization following blood transfusion. These observations on Red cell alloimmunization are an important finding in patients with β -major-Thalassemia. Thalassemia major patients managed by regular transfusion regimen may develop anti-red cell alloimmunization. If the alloantibodies are hemolyzing in nature, transfusion reaction may occur, and provision of blood thereafter requires matching of the relevant blood group in addition to 'ABO' and Rh 'D' matching. The hemolyzing nature of antibodies should be determined in patients who develop these antibodies, and transfusion should be arranged accordingly. Data regarding the impact of platelet refractoriness on morbidity and mortality for thrombocytopenic patients are inconsistent. Failure to achieve platelet counts greater than $5 \times 10^9/L$ significantly increases the probability of life-threatening bleeding. The rate of red blood cell alloimmunization is relatively low in our patients. The age at first blood transfusion and splenectomy were not statistically significant as risk factors for alloimmunization in this study.

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ANTIMICROBIAL EVALUATION OF THREE SPECIES OF *CASSIA SIAMEA* L.

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Key words: Antimicrobial activity; *Cassia siamea* L. *Enterobacter aerogenes*, *Salmonella typhi*

Abstract:

Antimicrobial activity of aqueous extracts of *C. siamea* Lam. was tested against three species of microorganisms; *Enterobacter aerogenes*, *Escherichia coli* and *Salmonella typhi* which were gram negative. The species of *Cassia* was found to be effective against the three test organisms. The Chloroform extract showed promising results with maximum inhibitory activity followed by Petroleum ether and then Acetone. The aqueous extracts were least effective with minimum inhibitory activity.

Introduction:

The history of medicine in India can be traced to the remote past in the 'Vedic' period. 'Ayurveda' is considered as complete medicine system that takes into consideration physical, psychological and ethical well being of mankind. The reason being, none but for the currently practiced medicinal system is not complete for all ailments encountered till date. Hence, there is growing importance in traditional health care system in providing better alternative for wider population across the globe. Synthetic drugs which are available have number of adverse effects on human beings. Not only these, but pathogens are now becoming resistant to the antibiotics used (Bandow *et al.*, 2003). Medicinal plants are a major source of a number of primary and secondary metabolites. These bioactive compounds are of therapeutic value (Kumananda and Sakia, 2003). The value and importance of traditional knowledge are now being increasingly acknowledged all over the world. *Cassia* species have been of medical interest due to their good therapeutic value in folk medicine (Abo *et al.*, 1999). *Cassia siamea* species is good ornamental plant and are used for landscape gardening. It is ingested almost daily in Thailand in various meals and where the fresh plant is not available; the dried leaves are pulverized and taken in capsules (Lose *et al.*, 2000; Alli Smith, 2009). It is antihypertensive, used against insomnia (sleeplessness), against dysentery and disorders of the large intestine. It has antioxidant property (Kaur *et al.*, 2006). This is an attempt to assess the efficacy of *Cassia siamea* medicinal for its bioactive chemical constituents and biological activity.

Materials and Methods:

Antimicrobial activity: In vitro antimicrobial activity was examined for Chloroform, Acetone, Petroleum ether and Aqueous extracts of *Cassia siamea* L. as used by traditional healers.

Plant material: *C. siamea* Lam. was collected from different regions of Amravati. The material was collected, air dried, then powdered and preserved in airtight bottles for further studies.

Micro-organisms: Two micro-organisms were obtained from the National Chemical Laboratory (NCL), Pune, India and one pathogen was isolated from typhoid patient. All three micro-organisms *Enterobacter aerogenes* (NCIM 5139), *Escherichia coli* (NCIM 2345) and *Salmonella*





typhi were gram negative. The bacteria were grown in the nutrient broth at 37⁰ C and maintained on nutrient agar slants at 4⁰ C. Chloramphenicol was used as a standard antimicrobial agent.

Extraction: Plants extracts were exhaustively extracted by Soxhlet extraction using each of the following solvents: Petroleum ether, Chloroform, Acetone and Distilled water. Each extract was concentrated and evaporated to dryness on a rotary evaporator. For extraction 10 gm dry plant powder was used every time. These extracts were oven dried, powdered and weighed. For antimicrobial testing the dried extracts were dissolved in their respective solvents.

Media Preparation and Antibacterial Screening: The antimicrobial assay was performed by agar well diffusion method (Bauer, 1966) for all four solvent extracts in Chloroform, Acetone, Petroleum ether and aqueous extract, using standard procedure. A well was prepared in the plates with the help of a cork - borer (1cm). 100 µl of the test compound of concentration 250 mg/ml was loaded into the well. The plates were incubated over night at 37⁰ C. For each micro-organism, four sets of each test solutions were prepared along with standard. The zone of inhibitions and its percentage are presented in Table –1 and 2.

Results and Discussion:

Entire work was carried out in aseptic conditions. Agar plates were kept in refrigerator for 30 minutes after addition of extracts to allow the diffusion of test solution in medium and then incubated. Antimicrobial activity of test solution and standard drug was observed after 24 hrs. The activity is expressed in terms of diameter, zone of inhibition measured in mm in each set and average of three was considered for comparison. For standard, average of all readings for each organism was calculated. *C. siamea* was found to be effective against the three test organisms. However the extract prepared in Chloroform showed promising results with maximum inhibitory activity followed by Petroleum ether and then Acetone. It was also observed that aqueous extracts were least effective as solvents of plant extracts showing the minimum inhibitory effect with all the three bacterial species (Table-1). Thus the results of solvent extract reveals better microbial properties as compared to aqueous extracts. It can be concluded that, *Cassia* species posses, intermediate inhibitory properties when extracted in the solvents against *Enterobacters aerogenes* and other two pathogens *Salmonella typhi* and *Escherichia coli*. Thus the plant could serve as useful antimicrobial agents in proper combination.

Table-1: Zone of Inhibition (ZI) in Millimeter after 24 hrs. Incubation at 37⁰C

Solvents	<i>Enterobacter erogenes</i> ZI (mm)	<i>Escherichia coli</i> ZI (mm)	<i>Salmonella typhi</i> ZI (mm)
Petroleum Ether	3	3	3
Acetone	8	7	3
Chloroform	6	4	9
Distilled water	2	1	3
Standard	12	12	15





STRUCTURAL EVALUATION AND ECONOMICS OF ICE-CREAM PREPARED BY REPLACING MSNF WITH SWEET POTATO POWDER

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Key words: Ice-cream, *Ipomoea batatas*,

Abstract :

Incorporation of different levels of sweet potato powder on the physical attributes, overall acceptability and cost of manufacture of ice-cream was studied. It was found that the addition of sweet potato powder in the production of ice-cream would be done at 5 to 15 per cent. The product prepared by addition of 5 to 15 per cent sweet potato powder was found to be acceptable as far as organoleptic score was concerned. Moreover, from the consumer point of view the sweet potato blend had more melting resistance. Thus ice-cream could be made available at a reasonable price and within the reach of common man.

Introduction:

Sweet potato (*Ipomoea batatas* L.) occupies a prime place in terms of calories production unit area and time. It is grown as a starchy food crop throughout the tropical, subtropical and frost-free temperate climatic zone in the world, approximately 80 per cent of the world. Sweet potatoes are grown in Asia, just under 15 per cent in Africa and about 5% in the rest of the world. Sweet potato is cultivated in an area of 9.2 million ha with an annual production of 138.4 million tones China occupies the first position in area. In India, it is grown as an area of 0.14 million ha producing 1.71 million tones with a productivity of 8.3 t/ha Sweet potato production is concentrated mostly in Orissa, Bihar, West Bengal, Uttar Pradesh, Maharashtra, Karnataka and Chhattisgarh. In Maharashtra it is grown in an area of 5.6 thousand ha (ICAR, 2006). The present work on ice-cream with desirable level of sweet potato powder would provide a better alternative with an objective of studies on preparation of ice-cream by replacing MSNF with sweet potato powder.

Material and Methods:

The quantity of buffalo milk, cream, sugar, sodium alginate and Sweet potato powder required for 1 kg batch of ice-cream for different treatments was calculated and mixed together as per the procedure outlined. The required quantity of sweet potato powder mixed with milk and blended with other ingredients while giving heat treatment for getting uniform ice-cream mix. The mix is then pasteurized/ heated at 68°C for 30 min. with continuous stirring to avoid formation of lumps. The mix was then immediately cooled to 4°C and aged for 18 hours. The ageing temperature did not exceed 5°C. After ageing of mix desired quantity of vanilla flavor and color was added. The ice-cream mix transferred to hand freezer to the temperature to -4 to -5°C for freezing. After freezing the ice-cream was drawn in ice-cream cups and kept for hardening in freezer for 12 hours and then it was utilized for biochemical and organoleptic evaluation (Figure-1)

Results and Discussion:

Results from Table 2 revealed that overrun of ice-cream prepared by incorporation of different levels of sweet potato powder ranged from 35.93 to 39.23 per cent. The maximum overrun was obtained in T₀ (experimental control) 39.23 per cent followed by T₁ (38.45), T₂ (36.67) and T₃

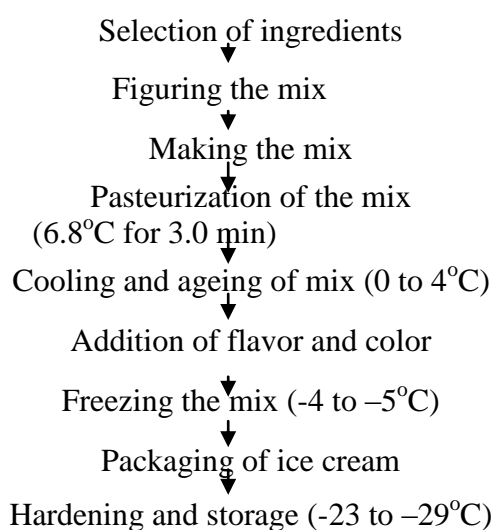


(35.93) in which significantly higher overrun was observed in treatment T_0 over the rest of treatments. The overrun decreased at decreasing rate as the percentage of substitution of sweet potato powder increased. The results obtained are in agreement with those reported by Metawally (1994) for red sweet potato ice-cream. Das *et al.* (1989) also observed the same trend in the overrun in ice-cream prepared by incorporation of different levels of potato pulp.

Table: 1 Treatment details

T_0	Ice-cream with no MSNF replacement
T_1	5 per cent MSNF replacement with sweet potato powder
T_2	10 per cent MSNF replacement with sweet potato powder
T_3	15 per cent MSNF replacement with sweet potato powder

Fig no 1: Flow chart for preparation of ice cream



Melting behavior of ice-cream is of particular interest from the consumer's point of view and depends upon the correct proportions of milk solids, ingredients used, formulations of mix and method of preparation. The results presented in Table 2 revealed that the melting behaviour of ice-cream prepared by incorporation of higher level of sweet potato powder melt down slowly. The melt down time required for treatment T_3 was significantly higher than the rest of the treatments. Rao (1988) reported that significant differences for melting time of ice-cream prepared from sweetened fermented milk. Andhare (2000) reported that significant differences for melting time of ice-cream prepared from safflower milk blended with buffalo milk. Bajwa *et al.* (2003) reported that significant differences for melting time of ice-cream prepared from strawberry pulp.

It was observed from the result presented in Table 2 that as the levels of sweet potato powder increased in the ice-cream, the score of overall acceptability of ice-cream decreased significantly. The treatment T_1 scored maximum points (8.80) followed by T_0 (8.24), T_2 (7.64) and T_3 (7.25). The ice-cream prepared by replacing milk solids not fat with sweet potato powder T_2 , T_3 i.e. 10 and 15 per cent substituted level was also quite acceptable as it was rated in between like moderately and like very much for all sensory attributes. It can be concluded from the results presented in above table the treatment T_1 was significantly superior over the rest of the

treatments. The results are in agreement with those reported by Andhare (2000) for overall acceptability score in ice-cream prepared from safflower milk blended with buffalo milk. Shaikh (2003) reported that 10 per cent rice flour in ice-cream was better in respect of overall acceptability.

Table: 2. Effect of incorporation of different levels of sweet potato powder on overrun, melting behavior and overall acceptability score of the ice-cream

Treatments	Overrun of the ice-cream (per cent)	Melting behavior	Overall acceptability
T ₀	39.23	31.00	8.24
T ₁	38.45	33.50	8.80
T ₂	36.67	40.66	7.64
T ₃	35.93	50.00	7.25
CD at 5%	0.743	1.637	0.15

The cost structure of ice-cream prepared was worked out and presented in Table 3. The values in Table 17 indicated that the cost of preparation of one kg ice-cream without sweet potato powder (T₀) was Rs.63.33 followed by treatment T₁, T₂ and T₃ i.e. Rs.62.4, 60.85 and 59.43 respectively. It was found that as the sweet potato powder level increased the cost of production decreased.

The cost of production of control sample was highest among all the treatments combinations. Hence, this is the major ingredient affecting the cost of the sweet potato powder. There was a reduction in cost of preparation of ice-cream by 6 per cent than control. Reduction in cost might be due to the cheaper sweet potato powder. Substantial reduction in the cost would be economically beneficial for both processors and consumers.

Table: 2 Cost of manufacture of ice-cream prepared by incorporation of different levels of

Particulars	ost/k g	T ₀		T ₁		T ₂		T ₃	
		ty. (g)	mt. (Rs.)	ty. (g)	mt. (Rs.)	ty. (g)	mt. (Rs.)	ty. (g)	mt. (Rs.)
<i>Buffalo milk</i>	15	595	8.93	595	8.93	596	8.94	596	8.94
Cream	150	208	31.20	210	31.50	210	31.50	210	31.50
Sweet potato	60	-	-	11.6	0.70	23.3	1.40	34.9	2.09
Sugar	16	150	2.40	150	2.40	150	2.40	150	2.40
Stabilizer	200	3	0.60	3	0.60	3	0.60	3	0.60
Skim milk powder	180	40	7.20	29.3	5.27	16.7	3.01	5.0	0.90
Vanilla flavor	20	-	1.00	-	1.00	-	1.00	-	1.00
Ice	3	-	3.00	-	3.00	-	3.00	-	3.00
Salt	4	-	4.00	-	4.00	-	4.00	-	4.00
Fuel	-	-	3.00	-	3.00	-	3.00	-	3.00
Labor	-	-	2.00	-	2.00	-	2.00	-	2.00
Total	-		63.33		62.4		60.85		59.43

sweet potato powder (Rupees)



ALTERNATIVE APPROACH FOR DIAGNOSIS AND TREATMENT OF JAPANESE ENCEPHALITIS VIRUS INFECTION USING IMMUNOINFORMATICS TOOLS: THE ROAD LESS TRAVELLED

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Key words: Antigenic Index, JEV, JaMBW

Abstract :

In the today's world, the neonatal deaths and miscarriage / abortion are increasing day by day. About 12-15% abortions is caused due to Japanese Encephalitis Virus (JEV) infection worldwide. The major cause for the death of patient is viral rapid growth and higher immunological behavior. In all, this virus has ten proteins (Including structural and non structural proteins) that can be antigenic in nature, out of which in the present study we have selected one of the structural proteins named Polyprotein. This protein is external to virus and is primarily exposed to host immune system upon its entry into host. In the present study we have checked the antigenicity of said protein by using the software JaMBW. To start with antigenicity determination firstly the protein sequences (Along with sequential variants of selected proteins) were extracted from NCBI databank in FASTA format. The extracted sequences were primarily screened for sequential similarity / conservity among them by using ClustalW alignment tool. Once the conserved sequences were identified each conserved sequence was then checked for its antigenic index using JaMBW software. Finally the discussion was made to use the highly antigenic epitopes in diagnosis and treatment of JEV infection.

Introduction:

Japanese encephalitis (JE) is a serious infection caused by a virus called Japanese encephalitis virus (JEV) (Endy *et al.*, 2002). Encephalitis means swelling of the brain and its spread through the bite of infected mosquitoes and not from one person to other (Arai *et al.*, 2008). Approximately 80,000 human JE cases occur annually in Asia (Solomon *et al.*, 2008). The causative virus belongs to the family flavivirus. The virus was first isolated in Japan during an epidemic in 1935 (Kumar *et al.*, 1988).

The genome of Flavivirus is single stranded RNA of positive sense 11,000 nucleotide (nt) in length (Ishii *et al.*, 1997). The most commonly recognized presentation of JE Virus (JEV) infection is acute encephalitis syndrome which is usually clinically indistinguishable from other causes of Acute Encephalitis Syndrome (AES) (Gourie Devi *et al.*, 1995). Structurally the virus consists of a polyprotein that contains an autocatalytic feature which automatically releases the first peptide, a virus specific enzyme. This enzyme is then able to cleave the remaining polyprotein into the individual products (Halstead *et al.*, 2008). The usual clinical presentation of acute encephalitis is fever, associated with nausea and vomiting, while neurological symptoms and signs including headache, lowered level of consciousness, vomiting, diarrhea etc. (Solomon *et al.*, 2007). Attempts to isolate Japanese encephalitis virus from clinical specimens are usually unsuccessful, probably because of low viral titres and the rapid production of neutralizing antibodies (Linkoln *et al.*, 1950). There are various methods available for diagnosis of JEV infection in patients. The isolates of JEV may sometimes be obtained from CSF (Cerebro Spinal Fluid) or from brain tissue (Desai *et al.*, 1995). Also the detection of viral antigen in tissue is



index. Upon calculating the antigenic index of all the polyprotein conserved regions as per the instructions given in software the final discussion is made to suggest how the end point of present study can be used in diagnosis and treatment of JEV infection.

Results:

In the present we have selected total ten variants of JEV polyproteins with the gene identification numbers, >gi|195970354, >gi|189086643, >gi|57900580, >gi|537635, >gi| 2318129, >gi| 6970070, >gi|3406735, >gi|6970068, >gi|168805242, >gi|81687253 in FASTA format. The sequences were further aligned using CLUSTAL W alignment software. After performing the alignment, the various conserved regions shared by the ten variants of polyproteins was located in bioedit software (Fig No.1).

Observations:

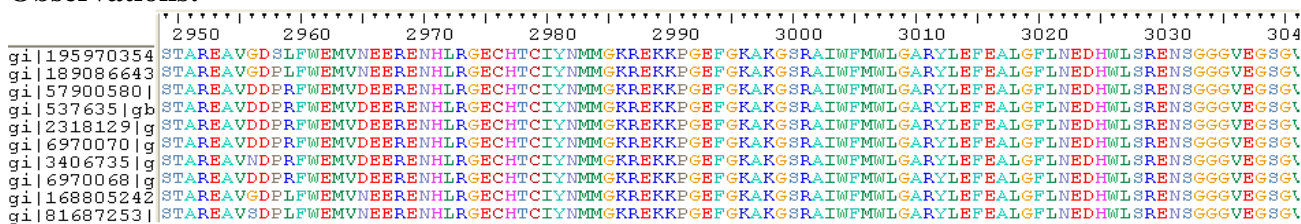


Fig. No. 1 : The Bioedit output showing the conserved region on aligned polyprotein variants (sequence of conserved region is MMGKREKKPGEFG).

Table No. 1: Position of the conserved regions on selected polyproteins with its sequence and obtained antigenic index

Sr. no	Conserved sequence/ region	Position on protein	Calculated Antigenic index
1	VNKRGGKKQNKRRGGNES	95-110	2.0
2	YWGSVKEDRI	1572-1581	1.8
3	AIVQGDRQEEPYP	1668-1680	2.0
4	TILEFGEGRVILG	1937-1949	1.9
5	LKIREENTDECDG	963-975	2.0
6	RHSKRSRRSVSV	212-223	2.0
7	YGMLEKTKADLKSM	2275-2288	1.9
8	MDVISREDQRGSGQV	3120-3134	2.0
9	MMGKREKKPGEFG	2983-2995	2.8





in preparation of vaccine, thus provides the immunity to susceptible person. By using Mabs as a tool of giving the passive immunity to the JEV patient as well as developing fetus.

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USE OF PLANT PROTEIN SOURCES AS A PARTIAL SUBSTITUTE FOR THE FISHMEAL IN THE DIET OF *CYPRINUS CARPIO*

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Key words: Plant proteins; *Cyprinus carpio*; Growth performance

Abstract :

Substitution of traditional fishmeal with various plant proteins in the diet of common carp, *Cyprinus carpio* was tested. Control meal (CM) containing groundnut oilcake and rice bran as main ingredients was compared with four experimental diets containing different plant proteins (asparagus meal AM; eichhornia meal EM; gliricidia meal GM and a mix of three plant sources meal MM). The plant protein inclusion level was kept at 40% in each diet. The growth trial which lasts after 120 days showed the promising fish growth results regarding inclusion of plant proteins in fish diet. Growth response of common carp to diets containing plant protein was better than control. These results show that selected plant protein meal can substitute up to 40% of the total protein of the diet without any negative effect on fish growth performance.

Introduction:

Protein is considered as a most important and most expensive ingredient of fish feed. A number of studies have evaluated various protein sources for fish feeds, but the results were not consistent. Attempts made by feed manufacturers and nutritionists to replace the fish meal component of practical fish feeds with alternative protein sources have generally led to reduced feed efficiency and growth (Tacon and Jackson 1985; Xie and Cui 1998).

Development of low-cost fish feed would help in enhancing aquaculture production. To overcome the problem of fish feed, many fish nutritionists replace the fishmeal partially or completely by locally available plant ingredients (Regost *et al.*, 1999; Coyle *et al.*, 2004; Olurin *et al.*, 2006; Stavros *et al.*, 2006). Partial or complete replacement of fish meal with alternative sources of protein is the best practice to overcome the expenditure on feeds. This approach was associated with a moderate reduction in feed utilization parameters (Hajen *et al.*, 1993). Therefore, the present study was undertaken to try partial replacement of fish meal protein with locally available plant sources for selected fish species, *Cyprinus carpio*.

Materials and Methods:

The feeding experiment was conducted in triplicate for 120 days. Fingerlings of *Cyprinus carpio* were used for the experiment. The plants used for the fish feed are *Eichhornia crassipes*, *Gliricidia maculata* and *Asparagus racemosus*. *Eichhornia crassipes* is an aquatic weed, *Gliricidia maculata* is used as a fodder for ruminants while *Asparagus racemosus* is a medicinal plant used in the health tonics. Four types of pelleted feeds were formulated using different ingredients such as rice bran, groundnut oilcake, fishmeal, guar gum binder, Vitamin – Mineral mixture, fine powder of selected plant products in different proportions (Table 1). The control meal (CM) was prepared mainly containing rice bran, groundnut oilcake and fishmeal as major



ingredients. Experimental diets were analyzed for proximate composition such as moisture, crude protein, crude fat, crude fibre and total ash (Table 2).

Table 1: Percentage of different ingredients used in formulated pelleted diets:

Ingredients	In percentage			
	CM	AM	EM	GM
Rice bran	42	13	13	13
Groundnut oilcake	37	30	30	30
Fishmeal	10	08	08	08
Guar gum binder	10	08	08	08
Mineral – Vitamin mixture	01	01	01	01
<i>Asparagus racemosus</i>	-	40	-	-
<i>Eichhornia crassipes</i>	-	-	40	-
<i>Gliricidia maculata</i>	-	-	-	40

CM: Control Meal; AM: Asparagus meal; EM: Eichhornia Meal; GM: Gliricidia Meal

Table 2: Proximate composition of pelleted diets: (per 100 gram)

Feed Ingredients	CM	AM	EM	GM
Moisture (%)	7.05	7.30	6.87	7.27
Ash (%)	12.13	7.48	13.08	11.38
Crude protein (%)	26.24	22.98	28.47	32.42
Crude fat (%)	3.81	4.72	7.63	6.26
Crude fibre (%)	12.54	16.58	10.79	11.76

CM: Control Meal; AM: Asparagus meal;
EM: Eichhornia Meal; GM: Gliricidia Meal

Fishes were fed at the rate of 5% body weight in two equal rations daily. At fortnightly intervals a minimum of 50% of fishes were sampled to record the growth. At the end of experiment, the growth parameters like mean body weight, specific growth rate (SGR), feed conversion ratio (FCR) and protein efficiency ratio (PER) were estimated. Difference between means of treatments was tested to find out the level of significance by ANOVA.

Results and Discussion:

The growth study in regard with body weight, specific growth rate (SGR), feed conversion ratio (FCR) and protein efficiency ratio (PER) were given detailed in the Table (3). There was no significant difference in final average of fishes among the triplicates ($p < 0.05$) the average growth was calculated taking the three values.

The best growth of fish, *Cyprinus carpio* was recorded in *Gliricidia* based feed followed by *Eichhornia* based feed and *Asparagus* one. *Gliricidia* containing feed showed highest SGR (1.19). The least growth recorded in control diet (0.95). Feed conversion ratio was found higher in asparagus meal (2.42) as compared to all diets, whereas protein efficiency ratio was higher in fishes fed with eichhornia meal (1.13).



Use of *Gliricidia* and *Eichhornia* leaf powder showed the good SGR results in the case of *Labeo rohita*, *Catla catla* and *Cirrhinus mrigala* (Das *et al.*, 1994; Vhanalakar *et al.*, 2008). The feed containing *Asparagus* showed nearby similar growth rate to control diet. The digestibility and acceptance of *Asparagus* feed is low as compared to other plant based diets used in the experimentation may be due to its more crude fibre content. The higher fibre content of *Asparagus* feed might have affected its utilization by fish. Feed containing higher amount of crude fibre affect the growth of fish (Leary and Lovell, 1975). The plant protein diets contained increasing amounts of fibre and anti-nutrients known to reduce digestibility of nutrients (Francis *et al.*, 2001).

Table 3: growth performance of fish with different experimental diets:

Growth parameters	CM	AM	EM	GM
Initial average weight (gm)	2.15 ± 0.2	2.3 ± 0.21	2.3 ± 0.24	2.3 ± 0.19
Final average weight (gm)	17.23 ± 0.33	24.26 ± 0.54	34.57 ± 0.20	35.25 ± 0.61
Weight gain (gm)	15.08 ± 0.33	16.85 ± 0.24	32.27 ± 0.18	32.95 ± 0.59
Specific growth rate (SGR)	0.95 ± 0.21	0.96 ± 0.46	1.23 ± 0.32	1.19 ± 0.76
Feed conversion ratio (FCR)	2.38 ± 0.41	2.42 ± 0.62	1.71 ± 0.28	1.52 ± 0.42
Protein efficiency ratio (PER)	0.29 ± 0.10	0.67 ± 0.21	1.13 ± 0.36	1.01 ± 0.52

CM: Control Meal; AM: Asparagus meal; EM: Eichhornia Meal; GM: Gliricidia Meal

The growth of fish depends upon the ingredients in the formulated feed (Glencross *et al.*, 2007). The highest growth of fishes provided by the *Gliricidia* was due to its higher protein content. Watanbe *et al.* (1987) found better growth of common carp with pelleted diet having high protein content. *Gliricidia* based diet also a promising alternative source of fish feed. In the present study, *Eichhornia* showed second highest growth results in fish. The dried powder of *Eichhornia* contains essential vitamins capable of promoting growth in fish included at low levels in vitamin free diets (Liang and Lovell, 1971). There was no any literature pertaining *Asparagus* as a fish feed ingredients. It is used in mammals as a health tonic.

In the present experiment, low cost of diets containing plant proteins in relation to control diet seems suitable. The utilization of plant protein diets could mean a lower price of fish. The present investigation indicated that locally available plant protein sources like *Eichhornia crassipes*, *Gliricidia maculata* and *Asparagus racemosus* for fish *C. carpio* fits well as compared with conventional feed. It may therefore be incorporated as a non-conventional source of protein in the diet of common carp reducing cost of fish feed.

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IN *SILICO* HOMOLOGY MODELING OF THYMIDYLATE SYNTHASE FROM THE NEMATODE *TRICHENILLA SPIRALIS*

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Keywords: Homology modeling; Thymidylate synthase, *Trichenilla spiralis*; Swiss-PdbViewer; Verify3D

Abstract :

The 3D structure of a protein is a prerequisite for structure based drug design as well as for identifying the conformational epitopes that are essential for the designing vaccines. A 3-dimensional model (3D) was developed for the Thymidylate synthase of *Trichenilla spiralis* nematode. A homology modeling method was used for the prediction of the structure. For the modeling, one template protein was obtained by mGenTHERADER, namely the high-resolution X-ray crystallography structure of Human Thymidylate synthase (1HZW). By comparing the template protein a rough model was constructed for the target protein using SWISSMODEL, a program for comparative modeling. The model was validated using protein structure checking tools such as Verify3D for reliability. Conformational epitopes are mapped from the 3D structure of Thymidylate synthase of *Trichenilla spiralis* nematode modeled using the concept of an antigenic domain. The information thus discussed provides insight to the molecular understanding of Thymidylate synthase of *Trichenilla spiralis*. The predicted 3-D model may be further used in characterizing the protein in wet laboratory.

Introduction:

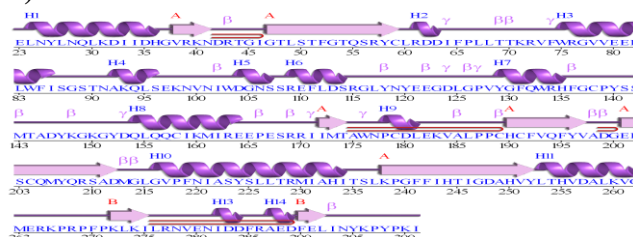
Trichinella spiralis is a parasitic nematode causing trichinellosis, a serious disease in human and other mammals (Despommier, 1998). Its muscle larva lives in a modified portion of host's skeletal muscle cell, the nurse cell, surrounded by a collagen capsule (Despommier, 1993). The nurse cell development, initiated by *T. spiralis* infection, is associated with a variety of changes, including cell-cycle reentry and induction of DNA synthesis, followed by the apparent G₂/M arrest of the infected cell in the cell cycle (Jasmer, 1995).

Thymidylate synthase (TS) (EC 2.1.1.45) converts dUMP to dTMP and is required for DNA synthesis in most organisms (Carreras and Santi, 1995). Consequently, TS has been studied extensively as a drug target (Stout *et al.*, 1998). A well defined structure of nematode TS can be a very useful tool for the development of novel drugs for pathogenic organisms. Thymidylate synthase (TS) catalyses the reductive methylation of dUMP by meTHF (N^{5,10}-ethylenetetrahydrofolate) to generate thymidylate (dTMP) and dihydrofolate (Carreras and Santi, 1995). As the reaction is the last step of the sole dTMP *de novo* synthesis pathway essential for DNA synthesis, and also for cell division and survival, TS is an important enzyme target in chemotherapy (Cohen *et al.*, 1958; Danenberg, 1977; Hardy *et al.*, 1987; Shoichet *et al.*, 1993). A recent related finding of potential significance is that TS appears to possess an oncogene-like activity (Rahman *et al.*, 2004). As our knowledge of the immune responses to a protein antigen progressed, it became clear that the whole protein was not necessary for raising the immune response, but small segments of protein called the antigenic determinants or the epitopes were sufficient for eliciting the desired immune response. Its immune protecting capacity is also checked in laboratory to confirm that peptide can be used as potential vaccine. Thus it has been showed that, the use of Bioinformatics tools and techniques not only reduce the time required to identify the candidate peptide as vaccine but also provides an insight in structure function relationship of nematode protein (Ingale, 2010).



drugs. Homology modeling is only a viable technique because it produces models that can be used for further research. Homology modeling helps in predicting the 3-D structure of a macromolecule with unknown structure (target) by comparing it with a known template from another, structurally highly similar, macromolecule. The target protein is structurally similar with the template if both the target and template sequences are similar. In our study, based on the results obtained from mGenTHREADER program, the X-ray structure of the of Human Thymidylate synthase (1HZW) were selected as templates. The three-dimensional structure of the Thymidylate synthase was predicted using the knowledge-based homology modeling approach. SWISSMODEL, used for building the model and global energy minimization. The sequence obtained from sequence database and was submitted to blastp search. After the BLAST analysis, PROCHECK was used to validate the model. The refined model was analyzed by different protein analysis programs including PROCHECK for the evaluation of the Ramachandran plot quality, and WHATIF for the calculation of packing quality.

Fig 1 A)



B)

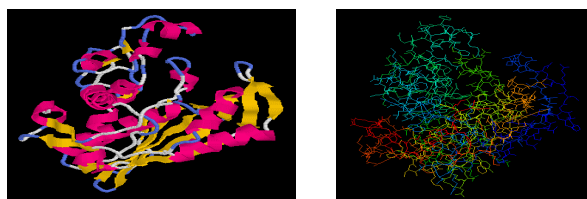


Fig 2

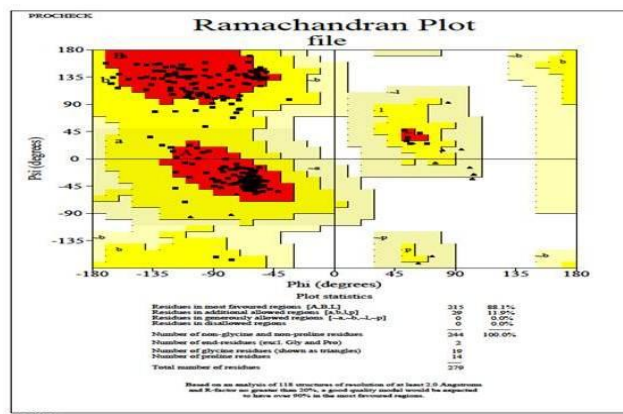


Fig.1 A) Predicted secondary and B) 3-D structure of Thymidylate synthase of *Trichenilla spiralis*

Fig 2: Predicted 3-D structure of Thymidylate synthase of *Trichenilla spiralis* Ramachandran plot analysis. The Plot statistics are: Residues in most favoured regions [A,B,L] 215 88.1%; Residues in additional allowed regions [a,b,l,p] 29 11.9%; Residues in generously allowed regions [-a,~b,-l,~p] 0 0.0%; Residues in disallowed regions 0 0.0%; Number of non-glycine



and non-proline residues 244 100.0%; Number of end-residues (excl. Gly and Pro) 2; Number of glycine residues (shown as triangles) 19; Number of proline residues 14; Total number of residues 279.

Conclusion: Developing successful vaccine for *Trichinella spiralis* will likely involved targeting multiple antigenic component of nematode to direct and empower the immune system to protect the host from nematode infection. DNA immunization hold great promise for providing safe and inexpensive vaccine for many infectious pathogens, including *Trichinella spiralis*. The direct injection of foreign genes by genetic immunization has resulted in specific immune responses that exhibit characteristic of protective immunity against the number of infectious agent in small animal model as well as primate studies. Thus, to improve chances of producing anti-peptide antibodies capable of recognizing Thymidylate synthase. We theorized that a successful immunization strategy against *Trichinella spiralis* infection could also involved a peptide vaccine.

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IMMUNODIAGNOSIS OF *HAEMONCHUS CONTORTUS* INFECTION IN SHEEP BY INDIRECT ENZYME LINKED IMMUNOSORBENT ASSAY (ELISA)

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Key words: *Haemonchus contortus*, Immunodiagnosis, Immunosorbent assay, Sheep,

Abstract :

Production of sheep is an attractive feature for farmers in Kashmir valley due to low capital input and the ability of sheep to thrive on native pastures. Almost every rural household is having sheep which serve the daily needs of milk, meat, wool, hides and valuable organic manure. However, the productivity of sheep is constrained by parasitic infections. Detection of serum antibodies against parasite by ELISA is a rapid and simple test with which a considerable number of samples could be processed at the same time. Furthermore, seroepidemiological studies involving examination of large group of animals might also benefit from a reliable ELISA. Usually such a test, in contrast to fecal examination, is less time consuming. Therefore an indirect ELISA based on crude somatic antigen of *H. contortus* was standardized and evaluated under field conditions as a diagnostic tool for detection of anti *H. contortus* antibodies in sera of infected sheep.

Introduction:

Production of sheep is an attractive feature for farmers in Kashmir valley due to low capital input and the ability of sheep to thrive on native pastures. Almost every rural household is having sheep which serve the daily needs of milk, meat, wool, hides and valuable organic manure. However, the productivity of sheep is constrained by parasitic infections (Dhar *et al.*, 1982; Tariq *et al.*, 2006). Sheep are usually more prone to gastrointestinal tract (GIT) parasitism as they mostly graze on pastures contaminated with L3 (Larval stage) of parasitic nematodes. *Haemonchus Contortus* is a major nematode infecting the sheep population (59.6%) of Kashmir valley which causes huge mortality and morbidity by affecting health, production and reproduction of animals (Tariq *et al.*, 2008).

Reliable detection of the active infection of *H. contortus* is usually based upon evaluation of clinical signs and fecal examination, which have their inherent limitations. Clinical signs usually become apparent only when the infection is heavy and the eggs are passed in the feces after the prepatent period of approximately 41 days (Soulsby, 1982) when the infection is much advanced and the major damage is already done. In order to circumvent these limitations there is an acute need for developing a reliable serological assay like enzyme linked immunosorbent assay (ELISA) for early detection of the infection. Detection of serum antibodies against parasite by ELISA is a rapid and simple test with which a considerable number of samples could be processed at the same time. Furthermore, seroepidemiological studies involving examination of large group of animals might also benefit from a reliable ELISA. Usually such a test, in contrast to faecal examination, is less time consuming. Therefore an indirect ELISA based on crude somatic antigen of *H. contortus* was standardized and evaluated under field conditions as a diagnostic tool for detection of anti- *H. contortus* antibodies in sera of infected sheep.

Materials and Methods:





hyper immune sera and parasitologically highly positive sera) were included. A cut off value of means of negative controls ± 3 SD was taken into account for the detection of each positive case. Out of the total 96 examined sera samples, 74 were found to be positive with plate ELISA having incidence rate of 77.08%. The present sensitivity, percent specificity, percent positive predictive value and present negative predictive value were calculated from the two way analysis table (Table 1) using following formulae: Sensitivity of plate ELISA was found to be 80.0% whereas specificity was 21.42%, indicating that this test is quite sensitive for clinical cases: an early diagnosis however lacks specificity. The percent positive and negative predictive values were found to be 10.81% and 90.0%, respectively for ELISA test. A marked difference was observed between the proportion of ELISA positive and fecal examination (floatation) negative samples. Seventy four samples were found to be positive by ELISA but only ten by fecal examination indicating that ELISA is significantly more sensitive method.

Table 1 Two way analysis table for sensitivity and specificity of parasitological method and ELISA plate

		ELISA test		
		No. of Positive animals	No. of negative animals	Total
Faecal examination (Flotation)	No. of Positive animals	8	2	10
	No. of negative animals	66	18	84
	Total	74	20	96

Discussion:

Diagnosis of gastrointestinal nematode infections has conventionally relied upon detection of the clinical signs, aided by qualitative detection of the eggs in the feces of suspected animals. Effectiveness of these methods is however since clinical signs are apparent only in heavy infection and the fecal eggs are detected in *Haemonchus* infection only after its patency on approximately 41 days (Soulsby, 1982) when the major damage is already done by the parasites. It is thus imperative to detect the infection at this stage for minimizing the associated economic losses, especially in weaned kids and lambs.

The standardized ELISA using easily available crude somatic antigen yielded promising results for detection of prepatent and patent haemonchosis in sheep. In experimentally infected sheep the infection was detected between 18 – 27 days after the infection and it was obviously much earlier than the time required for the infection to reach the patent period (42 days in the present study). ELISA is known for its potential to detect the antibodies at a quite early stage of the infection. Nevertheless, it could detect the artificially induced haemonchosis only after 17 days of the infection. The indirect ELISA was evaluated on field sera and the results were compared with the post-mortem findings with regard to the actual parasitological status. The assay proved high sensitivity (80.20%), specificity (21.42 %) and holds considerable promise for its exploitation in seroepidemiological studies of this economically significant helminthosis. Sequestration of antibodies and the formation of circulating immune complexes (Gasser *et al.*, 1993) and immune evasion mechanisms of the parasite (Spinelli *et al.*, 1996) might be responsible for wide variations in the antibody level in the necropsy positive samples as shown by indirect ELISA. Two false negative results in the present assay might be due to low worm burden or poor immune response of the host (Gasser *et al.*, 1994). Besides, host nutritional status (Jenkins *et al.*, 1991;





EVALUATION OF POTATO (*SOLANUM TUBEROSUM* L.) VARIETIES IN RESPECT TO NUTRITIONAL STATUS IN DEHYDRATED CHIPS DURING STORAGE

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Key words: Acidity and Ascorbic Acid, Potato chips, sugars, Starch, TSS.

Abstract :

Present study was carried out during the month of April to September 2008. The varieties viz V1 (Kufri Chandramukhi), V2 (Kufri Badshah), V3 (Lady Rozota), V4 (Kufri Lavkar), V5 (Kufri Chipsona-1), V6 (Kufri Chipsona-3), V7 (Kufri Surya), V8 (Kufri Pukhraj) in CRD with three repetitions. The nutritional value viz. Tss(0Brix), Acidity (per cent), Ascorbic acid (mg/100g), Total sugar (per cent), Reducing sugar (per cent) Starch (per cent) In respect of nutritional status viz. TSS and AA found maximum level in dehydrated chips of V5 (Kufri chipsona-3) and V2 (Kufri Badshah) variety, respectively while, minimum TSS and AA found in V7 (Kufri surya). The acidity observed maximum level in V8 (Kufri Pukhraj) and minimum in V1 (Kufri Chandramukhi) variety. In Kufri chipsona-1 variety found minimum TS, RS and maximum starch contain which was equally good with V1 (Kufri Chandramukhi) variety while maximum TS, RS and minimum starch contain observed in V3 (Lady Rozota) variety. In the storage behavior of nutritional status found decreased trend except in respect of TSS, TS as well as RS, it was found increased in trend during storage period.

Introduction:

Potato (*Solanum tuberosum* L.) is an important tuber crop and staple food of the world. It originates from the mountains of South America and belongs from Solanaceae family. In 16th century the potato was introduced as a curiosity. In India potato is grown as a vegetable crop but in eastern country it is grown as an agronomical crop. Potato is an annual, herbaceous, may be considered as a perennial because itself vegetatively. Less than half of potato production is used for human consumption. Potato consists of four components peel (5.9%), cortex (33%), outer medulla (35.4%), and pith (25.7%). It is good source of starch (70 to 80%), organic acid, Anthocynin, Ash and very less amount of reducing and non reducing sugar, carbohydrate, Vit-A, Vit-B1, B2, B6 and Vit-E. For processing quality of potato it should have high starch content, low reducing sugar and without sprouting. At storage it loss the moisture, starch converted in to sugar and greening which leads to unpleasant sweet taste. The dehydrated potato chips are a new trend of preservation. It can be stored more than six month for frying and preparation of flour for thick agent in soups, gravies, sauces and baby food. Potato mostly used for culinary purpose as well as in processing industry to prepare processed products like Frozen French frize (frozen chips), potato chips (crisps), potato flour, granules, Flakes etc. However chips are popularly commercial product of potato hence, it needs to evaluate different variety in nutritional point of view.

Material and Methods:

Methodology for chips processing: Round shape good quality of potato tubers of eight varieties are selected from Sardar Dantivada Agricultural University Deesa. The experiment carried out in CRD design in triplicate. The potato wash under the clean water, after the peeling cut into 2 mm thick slices, blanching in the boiling water with 0.25 % Sodium Meta bi-sulphate at 90-1000 C





for 2-3 minutes. The blanched slice kept in hot air oven for dehydrated at 600C for 10 hours. Dehydrated slice pack in polythene pouch and stored at room temperature for further storage studies. Prior to organoleptic evaluation the dehydrated chips will be fried in groundnut oil at 1800C (Marva and Pandey, 2006).

Result and Discussion:

The initial TSS (per cent) level of The V6 (Kufri Chipsona-3) gave highest value of TSS which was equally good with V1 (Kufri Chandramukhi) It might be due to the high TSS (per cent) content in tuber pulp varietal character of genetic behavior. While, the lowest was found in V7 (Kufri surya) Varieties having a high content of TSS remain highest and lower content of TSS remain lowest in dehydrated chips. The TSS content increasing trend was observed it might be due to the hydrolysis of polysaccharides and their subsequent conversion to reducing sugar as evidenced by decreasing the starch content of the chips (Table No.1).

This kind of observation was also recorded by Vijaylakshmi *et al.* (2005) in studies on onion products. The levels of acidity in dehydrated potato chips all stage were found non-significant. However, the acidity per cent found maximum in V8 (Kufri Pukhraj) variety While, lowest acidity was found in chips of V1 (Kufri Chandramukhi). The acidity content decreasing trend was observed. This may be due to varietal character of genetically behavior difference. And it also may be affected due to increasing in moisture level during the storage. That may be major factor for decreased level of acidity. The storage acidity has been influenced by metabolic changes; loss of acids might be due to utilization of acids for conversion of non reducing sugar to reducing sugar and non enzymatic reaction. This observation is supported by Sagar (2001) in preparation of onion powder by means of osmotic dehydration and storage. The initial status of the product with respect to ascorbic acid content was highest in V2 (Kufri Badshah which was equally good with v1 (Kufri Chandramukhi) variety than rest of the varieties may be due to the highest content of AA in tuber and status in behavior of chips in respective varieties trend was decreasing during the storage. While lowest ascorbic acid content was found in chips V3 (Lady Rozota) variety which was equally good with V4 (Kufri Lavkar) variety and decreasing during the storage and remain lowest, in mean value. The decreasing trend of ascorbic acid was found mostly due to its oxidation and as substrate in non enzymatic browning during the storage period and it is very sensitive to heat may be loss due to application of heat during processing. These kinds of observations were also recorded by Schwartz *et al.* (1987). Chemical physical and sensory properties of a Sweet potato French-Fry Type Product during Frozen storage. The content of TS and RS in the dehydrated potato chips was significantly minimum in V5 (Kufri Chipsona-1) at initial stage, while the highest TS in V3 (Lady Rozota), it might be due to the genetic character and status of the variety. The TS in increasing trend was observed in dehydrate potato chips during storage period it might be due the break down and hydrolysis of starch in to sugar. During the storage, this kind of observation also recorded by Pawar *et al.* (1988) in study of solar drying of white onion flakes, Vijaylakshmi *et al.* (2005) in studies of onion products, Sagar (2001) in preparation of onion powder by means of osmotic dehydration and storage. Initial stage chips of V5 (Kufri Chipsona-1) content maximum level of starch (per cent), which decreasing during the storage and remain maximum, while lowest the level of starch was found in chips of V3 (Lady Rozota) and it also decreasing trend and remains lowest among rest of the varieties. In potato chips high content of starch remains higher and lower content remain lower. The decreasing starch level can be seen mainly because of conversion of starch to sugar as evidenced by increased in total sugar content similarly changes were also seen by Sagar *et al.*(2000) in study of mango powder and Sharon and Usha (2006) study on bread fruit flour.



Table No.1: Nutritional changes in different varieties of dehydrated potato chips during six months of storage.

Different varieties of potato --		Total Soluble Solid (° Brix)			Acidity (Percent)			Ascorbic acid (mg/100g of powder)			Total Sugar (per cent)			Reducing Sugar (per cent)			Starch (per cent)		
		0	3	6	0	3	6	0	3	6	0	3	6	0	3	6	0	3	6
V1	Kufri Chandramukhi	4.9	5.23	5.75	0.580	0.561	0.540	28.43	27.57	27.45	0.200	0.210	0.60	0.0722	0.0815	0.108	59.47	59.24	58.94
V2	Kufri Badshaha	4.0	3.99	4.37	0.620	0.600	0.570	28.46	27.81	27.66	0.790	0.790	0.960	0.4890	0.5483	0.639	58.38	57.04	55.63
V3	Lady Rozota	3.3	3.52	4.07	0.590	0.577	0.557	24.10	23.01	27.76	1.340	2.327	2.850	0.7260	0.7990	0.875	53.34	52.33	51.26
V4	Kufri Lauvkar	4.3	4.79	4.82	0.580	0.547	0.530	25.70	24.41	24.06	0.747	0.860	0.069	0.4857	0.5123	0.566	56.62	54.98	53.27
V5	Kufri Chipsona-1	4.8	5.01	5.40	0.580	0.567	0.550	28.15	27.51	27.23	0.100	0.201	0.243	0.0623	0.0803	0.097	60.56	59.89	59.16
V6	Kufri Chipsona-3	5.0	5.35	5.90	0.610	0.590	0.560	27.37	26.21	25.68	0.600	0.740	0.870	0.3017	0.3317	0.372	59.50	59.50	59.16
V7	Kufri Surya	3.1	3.36	3.90	0.630	0.583	0.570	26.69	25.43	25.08	0.921	1.753	1.187	0.7193	0.7770	0.867	54.99	53.88	25.70
V8	Kufri Pukhraj	4.1	4.35	4.89	0.640	0.597	0.583	26.86	24.81	23.92	0.851	1.030	1.343	0.6670	0.7300	0.797	54.03	53.74	53.32
S.Em. ±		0.09	0.07	0.09	0.0153	0.0127	0.0107	0.56	0.47	0.42	0.012	0.06	0.015	0.006	0.005	0.01	0.69	0.38	0.63
C.D. at 5 %		0.28	0.21	0.26	NS	NS	NS	1.68	1.42	1.27	0.036	0.047	0.044	0.02	0.02	0.04	2.07	1.15	1.90
C.V%.		3.88	2.74	3.06	4.38	3.80	3.33	3.59	3.18	2.85	3.01	2.74	2.34	2.38	1.94	2.24	2.10	1.18	1.98





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EFFECT OF SUPPLEMENTATION OF RIBOFLAVIN ON ECONOMIC PARAMETERS AND BIOCHEMICAL CONSTITUENTS IN THE FAT BODY AND HAEMOLYMPH OF THE SILK WORM, *BOMBYX MORI* L.

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Key words: *Bombyx mori* L. Economic parameters, Glycogen, Haemolymph, Protein, Riboflavin, Trehalose.

Abstract :

Oral supplementations with riboflavin 100, 200 and 300 µg to silkworm larvae *Bombyx mori* L resulted in a significant increase in the cocoon weight and shell weights whereas the larval duration decreased significantly when compared with that of the carrier control. The glycogen and protein contents of haemolymph were also increased significantly. The above results indicate that the vitamin, riboflavin may stimulate the metabolic activity, thereby increasing the economic parameters in the silkworm, *B. mori* L.

Introduction:

The production of good quality of cocoons and silk depends on healthiness of larva and larval nutrition. The essential components of silkworm nutrition are proteins, lipids, carbohydrates, vitamins and minerals (Tazima, 1978). Vitamins is organic nutrients required in small amounts in the diet of vertebrates and in the invertebrates for proper growth and development. Plants largely synthesize vitamins; a few are synthesized by animals (Rajendra *et al.*, 1993) and the insects (Wakayama *et al.*, 1984). Bruins *et al.* (1991) studied the dietary effect of ascorbic acid, pyridoxine and riboflavin, which reduced the light sensitivity in the *Drosophila melanogaster*. It has been reported that feeding of butter, vitamin B complex and glucose smeared leaves to *Antheraea mylitta* resulted in increase in larval weight, cocoon weight and fecundity (Kumarilalitha *et al.*, 1992). It has been reported that the supplementation of ascorbic acid to silkworm larvae has increased the fecundity (Chauhan and Singh, 1992), cocoon yield and filament length (Sarkar *et al.*, 1995). It has been reported that the vitamin, folic acid significantly increased the larval weight, silk-gland weight and fecundity in all the treated groups (Nirwani and Kaliwal, 1996).

The biochemical constituents of the fat body and haemolymph are mainly depends on the nutritional quality and environmental factors in the silkworm. It has been reported that pyridoxine is involved in amino acid metabolism (Bhattacharya, 1981) has shown that vitamin B₁₂ stimulates protein and nucleic acid synthesis in the silk gland of nistari race of *B. mori*. It has been shown that the implication of folic acid as a cofactor for the conversion of phenylalanine to tyrosine in *Antheraea mylitta* (Wicker *et al.*, 1985). Therefore, the present investigation was undertaken to study the effect if riboflavin economic parameters, glycogen and protein contents of the fat body and trehalose protein contents of the haemolymph in the silkworm, *B. mori*.

Materials and Methods:

The disease free laying (DFLS) of bivoltine race (NB₄D₂) of the silkworm were obtained from Grainage center, Rayapur, Dharwad, Karnataka State and reared in the improved methods of the silkworm rearing techniques (Krishnaswami, 1978). The fourth stadium larvae divided into five



experimental groups including controls and every group consist of uniformly weighed larvae in five replications of 20 worms.

The vitamin riboflavin procured from Rallies India Ltd., Madras, India. The vitamin, riboflavin was dissolved in distilled water to give three concentration viz., 100, 200, and 300µg/ ml. The fresh mulberry leaves were soaked in these concentrations for 15 minutes and then leaves were dried and fed to the silkworm *ad libitum* at fourth and fifth stadium. Among the four feedings of untreated leaves, the normal control was fed with untreated leaves. The larval, cocoon and adult parameters were recorded separately. The larval and silk gland weights were measured before commencement of the spinning. The larval duration was measured from the body of hatching to till the completion of spinning. The cocoon parameters such as female and male weights and their shell weights were measured on the fifth day after the completion of spinning activity. The cocooning percentage was calculated by the formula shown below. Each mean value was the observation of 10 silkworms.

$$\begin{aligned}
 & \text{Number of cocoons formed} \\
 \hline
 1. \text{ Cocooning percentage} &= \frac{\text{Total number of larvae kept} \times 100}{\text{Cocoons shell weight (g)}} \\
 \hline
 2. \text{ Female / Male cocoon shell ratio} &= \frac{\text{Cocoon weight}}{\text{Cocoon weight}} \times 100 \\
 \hline
 & \text{Total Number of eggs hatched} \\
 \hline
 3. \text{ Hatching percentage} &= \frac{\text{Total Number of eggs hatched}}{\text{Total Number of eggs laid}} \times 100
 \end{aligned}$$

Biochemical Parameters: The silkworm larvae dissected in *Bombyx* saline at pH 6.5 on 6th day of fifth instar. The fat body was immediately collected and used for the glycogen (Sciefter *et al.*, 1950) and protein (Lowry *et al.*, 1951) estimations. The heamolymph was collected by amputation one of the thoracic legs in pre chilled centrifuge tube and was used for the estimation of trehalose (Roe, 1955) and protein (Lowry *et al.*, 1951). Anthrone positive carbohydrate in the heamolymph is considered as trehalose.

Statistical Analysis: The data collected were subjected to statistical analysis of variance test to find out the significance between the parameters of the untreated and treated groups (Raghava Rao, 1983). The present index was calculated for each parameter of the experimental groups over those of the corresponding parameters of the carrier control.

Results and Discussion: The results on the oral supplementation of riboflavin to silkworm larvae on economic parameters and biochemical constituents in the fat body and heamolymph are presented in tables 1, 2, 3, and 4.

Larval weight: The results of the present study have shown that the feeding of mulberry leaves treated with riboflavin had no significant effect on the larval weight (Table 1). Similar results have been reported in the silkworm, *B. mori* and in locusts on feeding with Thiamine, Carnitine, Thiokitic acid, cobalmin, glutathione, adenine, yeast and nucleic acid alone or with a certain combination in the artificial diet containing casein (Nirwani and Kaliwal, 1988; Dadd, 1961). In contrast, it has been reported that the dietary supplementation with vitamin B, C and folic acid to *B. mori* showed a significant increase in the larval weight (Sarkar *et al.*, 1995; Nirwani and



Normal control	-	2.026 (96)	0.361 (93)	17.90 (95)	1.337 (95)	0.321 (90)	24.16 (95)
		S	S	NS	S	S	S
CD at 5%		0.133	0.032	1.55	0.124	.0035	1.83

* -Significant increase /decrease at 5%, S -Significant, NS -Non- Significant,

CD -Critical Difference Percentage increase/decrease over that of the carrier control in parenthesis.

Larval Duration: The larval duration decreased significantly in all the riboflavin treated groups(table 1). Similar findings have been show with the supplementation of vitamin, folic acid (Nirwani and Kaliwal, 1996). McFarlane and Ali (1988) have reported that duration was reduced in the larvae of *Acheta domesticus* reared on the food containing vitamin E and vitamin K. It is well known that molting and juvenile hormones control molting and metamorphosis in insects. The increased or decreased larval duration due to this vitamin treatment might possibly be mediated through the molting and juvenile hormones by altering secretory activity of the neurosecretory cells. However, further investigation is essential to understand the mechanism of action of riboflavin on larval duration.

Table 3. Effect of Riboflavin on the adult parameters the silkworm *B. mori*

Treatment	Dose µg/ml	Fecundity	Hatching percentage (%)
Riboflavin	100	674 (99)	97.18 (101)
Riboflavin	200	698 (103)	94.64 (98)
Riboflavin	300	712 (105)	96.21 (100)
Carrier control	Distilled Water	675 (100)	96.95 (100)
Normal Control	-----	659 (97)	95.95(99)
		NS	NS
CD at 5%		45.16	1.76

*- Significant increase /decrease at 5%, S -Significant, NS -Non-significant,

CD -Critical difference percent increase /decrease over that of carrier control in parenthesis.

Table 4. Effect of Riboflavin on the Biochemical constituents of the silkworm *B. mori*

Treatment	Dose µg/ml	Fat body gltcogen µg/ml	Haemolymph Trehalose µg/ml	Fat body protein µg/ml	Haemolymph Protein µg/ml
Riboflavin	100	30.53* (153)	348.50* (112)	59.99* (128)	3774* (113)
Riboflavin	200	29.53* (152)	382.20* (122)	60.40 (131)	3771* (113)
Riboflavin	300	28.93* (149)	428.10* (137)	62.00* (132)	3939* (118)
Carrier control	Distilled water	19.33 (100)	310.80 (100)	46.66* (100)	3327 (100)

Normal control	-----	19.13 (98)	300.30 (96)	48.99 (104)	3576 (107)
		S	S	S	S
CD at 5%		3.53	33.87	8.83	365.00

*- Significant increase /decrease at 5%, S -Significant, NS - Non – Significant

CD –Critical difference, Percent increase /decrease over that of the carrier control in parenthesis.

Cocooning percentage/ Survival percentage: Feeding with all the three concentration of riboflavin had no effect on the cocooning percentage (Table.1) there by indicating that the used concentrations have not adversely affected the cocooning percentage. Similar findings have been reported with the supplementation of vitamin folic acid and thiamine to *B. mori* (Nirwani and Kaliwal, 1996 and 1998). However, it has been reported that the silkworm larvae *Anthererea mylitta* fed on butter or vitamin B complex smeared leaves failed to form cocoons (Kumarilalitha *et al.*, 1992)

Cocoon Weight, Shell Weight and shell Ratio: The female and male weights and their and shell weights significantly increased in all the riboflavin treated groups (Table 2).A maximum increase in female cocoon (11%) and shell weights (16%) was observed in 300 µg treated group and male cocoon weight (34 %) in 300 µg and shell weight (20%) in 200 µg treated groups. Similar findings have been reported with the supplementation of vitamin, pyridoxine to *B. mori*. This may be due to protein conversion efficiency of the silk gland by the vitamin pyridoxine (Hamano, 1989). The increase in the cocoon shell weight in the present study might be due to the protein conversation efficiency of the silk gland results in the increased cocoon shell weights.

Fecundity: In the present study all the three concentrations of riboflavin had no significant effect on the fecundity is may be due to non-stimulatory effect of riboflavin on the ovary when compared with that of carrier control (Table 3) In contrast, supplementary with vitamin C and folic acid to *B. mori* showed a significant increase in the fecundity (Ito and Arai, 1965; Chauhan and Singh, 1992; Nirwani and Kaliwal, 1996 and 1998).

Hatching percentage: The results of the present study have shown that supplementation with riboflavin in the larval stage neither improved the hatchability of eggs nor adversely affect it (Table 3).

Biochemical Parameters

Effect of riboflavin on the fat body glycogen and haemolymph trehalose: Dietary supplementation with riboflavin has significantly increased the fat body glycogen and hemolymph trehalose when compared with that of carrier control (Table 4). Similar findings have been reported in the silkworm fed with vitamin folic acid thiamine (Nirwani and Kaliwal, 1996 and 1998). It has also reported in the Eri silkworm, *Philosamia ricini* after supplementing the feed with vitamin a result in the significant increase in the fat body glycogen (Padaki, 1991).the increase in the trehalose content might possibly be due to the conversion of glycogen into trehalose and its subsequent release into hemolymph by the fat body. However the exact mechanism of action of riboflavin on synthesis of glycogen and its conversion into trehalose has to be investigated.



Effect of riboflavin on fat body haemolymph protein : The protein content of the body haemolymph was significantly increased in all the riboflavin treated groups when compared with that of carrier control (Table 4). A maximum increase in protein content of fat body (32%) and haemolymph (18%) was observed in 300mg riboflavin treated groups. It is interesting to note that there was a significant increase in the silk gland weight and cocoon shell weight of females and males in riboflavin treated groups (Table 2). It has been reported that the protein content of the body and of the haemolymph was significantly increased in the folic acid and thiamin fed groups (Nirwani and Kaliwal, 1996 and 1998).

It has been reported that vitamin C is involved in the larval growth of insect (Navok *et al.*, 1981), affect the levels of the amino acids (Bounias, 1980). Bhattacharya (1981) has reported that vitamin B12 stimulates protein and amino acid synthesis in silk gland. These reports suggest that the vitamins are involved in protein and amino acid synthesis and metabolism. The present results suggest that the riboflavin treatment might have stimulated the synthesis and release of protein by fat body into the haemolymph and immediate sequestering of the haemolymph protein by the silk gland. Since, the silk gland weight is significantly increased which subsequently resulted in a significantly increase in female and male cocoon shell weights in riboflavin treated groups (Table 1 and 2). This inference may support the view of earlier workers that the vitamin riboflavin may stimulate the synthesis of protein in insects.

In conclusion, the vitamin, riboflavin may have effect on protein synthesis and thereby increases the economic parameters of the silkworm, *B. mori*. However, the exact mechanism of action riboflavin on biochemical constitutions of the fat body and haemolymph and on the economic parameters of the silkworm needs to be confirmed by further investigation.

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DIVERSITY OF AQUATIC MACROPHYTES FROM NATHSAGAR DAM PAITHAN, DIST. AURANGABAD.

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Key words: Diversity, Aquatic Macrophytes, Nathsagar Dam

Abstract :

The present study deals with the Diversity of aquatic macrophytes from Nath Sagar Dam, Paithan. The study was conducted from July 2004 to June 2005. The work on diversity of aquatic macrophytes has not been done so an attempt was made to study the distribution of Aquatic macrophytes from Nathsagar Dam Paithan. A total 21 macrophytic species were recorded, out of these 05 species are free floating, 03 species are rooted floating, 03 species are submerged, 09 species are emergent, 01 species amphibian were recorded.

Introduction:

Aquatic plants serve as a good source of food to mankind and animals. They may also serve as a good source of fertilizers. Some of the aquatic plants are being cultivated for their diversity of medicinal and aesthetic value (Bardach, 1968). The immense admiration of the beautiful flowers of the lotus and water lilies is reflected in ancient architecture, paintings and poems. In Indian mythology, the sacred louts, a common aquatic weed, has been regarded as a symbol of cosmic creativeness. The study of Diversity of Aquatic Macrophytes in different freshwaters bodies was carried out by several workers (Zutshi *et al.* 1980, Dey and Kar, 1989, Kiran *et al.*, 2006).

Material and Methods:

During July 2004 to June 2005 survey were carried out from Nathsagar Dam Paithan. The aquatic macrophytes occurs at lentic habitat from Nathsagar, these were collected and identified.

Results and Discussion:

Twenty-one macrophytic species were recorded. The species was grouped into different categories such as free floating rooted floating, submerged, Emergent, Marshy amphibian as shown in table No. 1. The present findings are in agreement with earlier studies on some water bodies of Manipur and Bhadra fish form Karnataka by Okram *et al.* (1996). Devi and Sharma (1998) and Kiran *et al.* (2006). The massive growth of Aquatic macrophytes such as *Hydrilla verticillata* and *vallisnaria* species initiate succession leading to shallowing of the water bodies. These species shows more vegetative cover during winter and premonsoon.

The emergent varieties *Typha species*, *Cyndon dactylon* and *Cypersus* grow most rapidly and their dominance was observed throughout the year. *Ipomea aquatic* shows significant growth. Nymphaea species, *Hydrilla verticillata* and *vallisnaria* species propagated and sold as ornamental plants for decorative purposes in gardens and aquarium. The Aquatic macrophytes are used for food, medicine and religious function by Nather Khan (1990). Marginal or partially



submerged plants and useful in preventing soil erosion. Some freshwater macrophytes provide breeding ground for migrating birds and breeding ground for snails. Local people collect snails as food. During the present investigation it is observed that an increase in the growth and frequency of distribution of different aquatic macrophytes was correlated with an increase in phosphate and nitrogen contents of water bodies. The increased dissolved oxygen (DO) and free carbon dioxide in the water bodies gradually favored the growth and distribution of macrophytes.

Table No. 1: Plant species and there types found in the Nathsagar Dam, Paithan.

Type of Species	Name of Plants
Free floating	<i>Spirodela polyrrhica</i>
	<i>Azolla pinnata</i>
	<i>Potamogeton perfoliatus</i>
	<i>Pistia stratiotes</i>
Rooted floating	<i>Nymphaea pubesconce</i>
	<i>Trapa bispinora</i>
	<i>Najus indica</i>
Submerged	<i>Hydrilla verticillata</i>
	<i>Vallisnaria natans</i>
	<i>Ottelia alismodes</i>
Marshy amphibian	<i>Marsilea quadrifolia</i>
Emergent	<i>Altenanthera phioloxiroides</i>
	<i>Cyperus iria</i>
	<i>Cyperus difformis</i>
	<i>Ipomea aquatica</i>
	<i>Cynodon dactylon</i>
	<i>Jussiaea repens</i>
	<i>Typha indica</i>
	<i>Phyla nudiflora</i>
<i>Polygonum globrum</i>	

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**ARTIFICIAL CONTROL MEASURES OF PESTIFEROUS LAND SNAIL,
MACROCHLAMYS PETROSA (HUTTON).**

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Key words: *Macrochlamys petrosa*, molluscicides, pestiferous.

Abstract :

The land snails and slugs are important to man as a pest because of damage caused in agriculture, horticulture and forestry. The present snail *Macrochlamys petrosa* is moisture loving and feeding actively during monsoon and winter seasons of the year. For the control purpose of this snail it is essential to understand in detail ecobiology of these snails. The control of *Macrochlamys petrosa* was checked in the laboratory by conducting experiments under laboratory conditions. This experiments were carried out by using chemical agents like Sodium Pentachloroplenate, Copper Sulphate, Mercuric chloride, Zink Sulphate and cadmium nitrate for assessing the toxicity of above molluscicides. Dusting the powder of chemical on the snails, mixing the chemicals with soil and sprinkling the liquid concentrations of these chemical on food of snail were tested. It is observed that direct dusting of the powder of chemical on snail and sprinkling the liquid concentration of these chemicals on food of the snail is most effective as compared to mixing the chemical with soil.

Introduction:

The present investigation has been carried out on the land snail *Macrochlamys petrosa* (Hutton), is a representative of order stylommatophora of the family Ariophantidae. This snail is found distributed in the vicinity of Aurangabad (M.S.). Since snails and slugs are found as pest throughout the World, it has become necessary to solve this problem by artificial control. Various researchers studied this problem (Getzin, 1965; Newell, 1968; Runham and Hunter, 1970 and Vyawahare, 1986). Molluscan pest can be destroyed in several ways, by chemical means (molluscicides), through the biotechnical measures and by mechanical methods. Copper sulphate is the classical molluscicide which has been used against terrestrial pulmonates and is regarded as favorite compound for the control of giant African snail, *A. fulica* (Strufe, 1968 and Christie *et al.*, 1978).

Crowell (1977) published a detailed report on chemical control of terrestrial snails and slugs. He tested as many as different types of organic and inorganic chemical agents for their molluscicidal properties, against several species of slugs and snails. Olivier and Haskins (1960) showed that sub-lethal concentration of pentachlorophenate could reduce the fecundity and egg production and egg viability of *Biomphalaria glabrata*. The effect of several herbicides such as aminotrizol, chloroprophan, dalapon, lenacil, linuron and simazon on the slugs, *Arion rufus*, *D. reticulatum*, *Limax maximus* and *L. flavus* were tested (Godan, 1963).

Material and Methods:

Control of the snail, *M. petrosa* was checked in the laboratory by conducting experiments under laboratory conditions. Laboratory experiments on artificial control were carried out by using chemical agents, like sodium pentachloroplenate, Copper Sulphate, Mercuric chloride, Zinc





Sulphate and Cadmium Nitrates for assessing the toxicity of above molluscicides following experiments were carried out (1) dusting the powder of chemical on snails (2) mixing the chemicals with soil and (3) sprinkling the liquid concentrations of these chemicals on food of snail.

Results:

Different chemicals viz. Sodium Pentachloroplenate, Copper Sulphate, Mercuric Chloride, Zinc Sulphate, and Cadmium Nitrate were lightly dusted on the snail, mixed with soil and sprinkled the liquid concentrations of these chemicals on food of snail and their effects were noted. It was found that, these chemical compounds were highly toxic to the snails and immediate secretion of slime was there and within 10 to 20 minutes death of animal observed. It is observed that direct dusting of powder of chemicals on snail and sprinkling the liquid concentration of these chemicals on food of snail is most effective as compared to mixing the chemical with soil. Because snails avoids substratum of soil mixed with chemical and they escape from that site (See Table). It is also observed that, no death was occurred in some snails since the dusted material was cast off with slime, but 100% mortality observed in chemical sprinkled food consumed snails.

TABLE: Effect of dusting the powder of chemical on snails (Five animals /test)

Sr. No.	Test substance	Action of test substance towards snail	Remark.
1	Sodium Pentachloroplenate	Slow secretion of slime material, death within 20 to 25 minutes	Less toxic
2	Copper Sulphate	Immediate and profuse secretion of slime, death within 10 minutes	Highly toxic
3	Mercuric Chloride	Immediate and profuse secretion of slime, death within 10 minutes	Highly toxic
4	Zinc Sulphate	Slow secretion of slime death within 20 to 25 minutes	Less toxic
5	Cadmium Nitrate	Immediate secretion of slime death within 15 minutes	Highly toxic

Discussion:

A considerable work has been done on the control of snails and slugs and numerous substances have been recommended as these substances proved good results. Many chemical molluscicides are repellent at high concentration but are effective at very low concentration; between these two extremes the response to them is indifferent (Godan, 1958). The most commonly used chemical substance as molluscicide is the copper sulphate. Holz (1962) has observed that the efficiency of Copper Sulphate is very greatly reduced by the mud of the fields. Muller (1962) found that molluscicidal action of Copper Sulphate is very greatly reduced by alkaline or hard water and by vegetation and organic matter of the area under treatment. Kulkarni and Nagabhushanam (1973) found that the chemical substances such as Potassium cyanide, Coppersulphate, Ammonium sulphate, Ammonium chloride, Potassium permanganate were highly toxic to slug *Laevicaulis alte*. Similar studies on the land snail, *Cryptozona semirugata* by Mantale, (1970), revealed that Copper sulphate, Potassium cyanide, Potassium permanganate were deadly toxic to the snail and caused 100 % mortality within short time. Bodhankar (1984) and Vyawahare (1986) have used





various chemical substances for testing their toxicity to the slug, *Laevicaulis alte*. They showed that certain compounds like Arsenious trioxide, Cadmium nitrate, Copper sulphate, Cupric chloride, Mercuric chloride, Mercuric sulphate, etc. were highly toxic to the slug. Kalyani (1990) while working on effect of feeding Copper sulphate to *Achatina fulica*, suggest that reduction or cessation of egg laying in response to high levels of added dietary copper is due to the effect of copper on protein of albumen gland than polysaccharide.

In the present investigation on the artificial control of *Macrochlamys*, dusting the powder of Copper sulphate, gives immediate and profuse sliming, rapid movement twisting of body, tentacle protrude out and within 15 to 20 minutes death of snails takes place. It is observed that direct dusting of powder of chemicals on snail and sprinkling the liquid concentration of these chemicals on food of snail is most effective as compared to mixing the chemical with soil.

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ANTIBIOTIC SUSCEPTIBILITY PATTERNS OF *E. COLI* ISOLATES FROM URINE SAMPLES OF PATIENTS IN SOLAPUR, MAHARASHTRA.

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Key words: Antibiotic susceptibility, *E. coli*, Cefuroxime, Cephataxime, Ofloxacin, Levofloxacin, Doxycycline.

Abstract :

The present study was undertaken to assess the antibiotic susceptibility patterns of *E. coli* isolates from urine sample at Yashodhara superspeciality Hospital, Solapur, Maharashtra. Out of 100 urine sample 36 samples were positive for *E. coli* and 24 samples were positive for other organism. Antibiotic sensitivity test was done by using 15 antibiotics by disk diffusion test on Muller Hinton Agar for *E. coli*. The highest numbers of *E. coli* infections were found in urine sample. Among the isolated strains of *E. coli*, 97.2 % were resistant to Cefuroxime and Cefdinir, 94.4 % were resistant to Levofloxacin, 88.8 % resistant to Ofloxacin and Cephataxime 86.1 % resistant Doxycycline and sensitive to remaining antibiotics used. From present study we conclude that Urinary Tract Infection is the most common hospital acquired infection, in order to avoid rapid emergence of resistant strains. Periodic susceptibility testing should be carried out over a period of two to three years, to detect the resistance trends. Also a national strategy on the limited and prudent use of anti *E. coli* agents is urgently required.

Introduction:

Multiple antibiotic resistances in bacterial populations is a great clinical problem, Hence, there is a need to conduct area specific monitoring studies to profile different pathogens responsible for specific infections and their resistance patterns, so as to generate data that would help clinicians to choose the correct empirical treatment (Viren et al., 2008). Antimicrobial resistance profile of bacterial isolates from ICU: hanging trends studied by Anupurba and Sen (2005). Desai and Desai (1990) observed and studied the Methods in microbiology and microscopy and stains for bacteria. In 1988 Fule *et al.*, observed the Cholera epidemic in Solapur during July-August.

Glass *et al.* (1980) studied the emergence of multiply antibiotic-resistance *Vibrio cholerae* El Tor in Bangladesh . Prashanth and Badrinath (2000) find out the simplified phenotypic tests for identification of Acinetobacter species and their antimicrobial susceptibility status. Recently Preeti Mindolli (2010) pointed out by the identification and Speciation of Acinetobacter and Their Antimicrobial Susceptibility Testing. *E. coli* is causative pathogen of Urinary Tract Infection (UTI). *E. coli* shows resistance to multiple antibiotics thereby jeopardizing the selection of appropriate treatment. Therefore the present study was undertaken to find out the antibiotic susceptibility patterns of pathogenic isolates of *E. coli* from urine sample.

Material and Methods:

The project was undertaken at Yashodhara Superspeciality Hospital, Solapur, Maharashtra between January and February 2010.



Sample collection:

The 100 urine samples were collected from different age groups at Yashodhara Superspeciality Hospital, Solapur.

Media:

Nutrient agar – (Peptone 5 g/L, Meat extract 1 g/L, Yeast extract 2 g/L, Sodium chloride 5 g /L, Agar g/L, pH- 7.0), was used for the isolation of *E. coli* and Mueller Hinton agar- (30.0% beef infusion 1.75% casein hydrolysate 0.15% starch 1.7% agar pH adjusted to neutral at 25 °C was used for the antibiotic susceptibility test.

Isolation:

E. coli strains were isolated from the urine sample on the Nutrient agar by quadrant streak, and then incubated at 37°C for 24 hour.

Antibiotic susceptibility test:

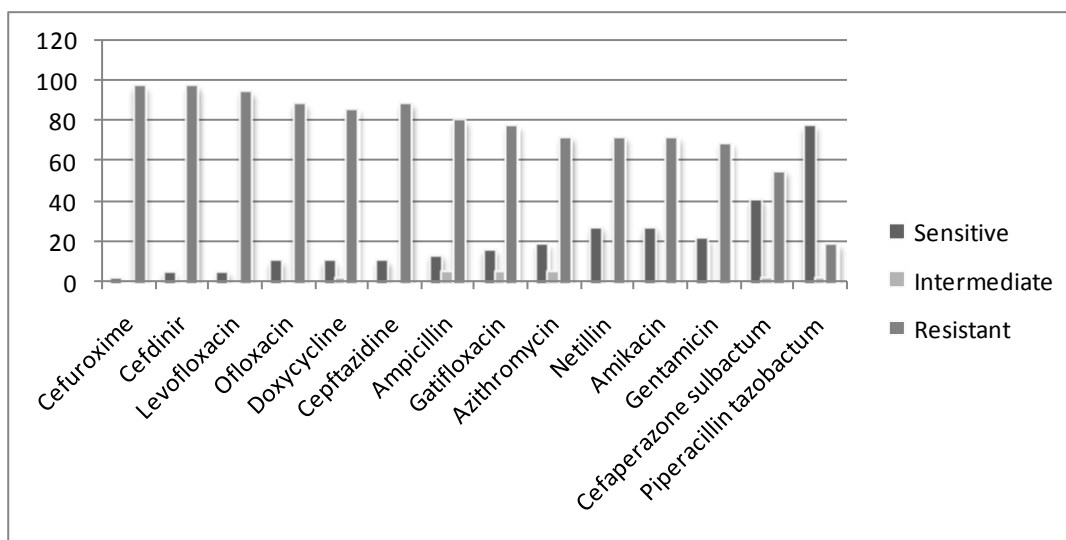
Mueller Hinton Agar (M173) plates were prepared according to Bauer-Kirby Method. Pure cultures of isolated *E. coli* strains were used as inoculums. Pure culture, 3-4 similar colonies were selected and transferred them into about 5ml of suitable broth such as Tryptone soya Broth (M011) for enrichment, then incubated at 35°C for 2-8 hours till to moderate turbidity. Sterile cotton swab was dipped into the standardized inoculums and streaked the entire agar surface and allowed for drying for 5-15 minutes with lid. Antibiotic discs were placed using aseptic technique (The standard antibiotics discs used were Cefuroxime, Cefdinir, Levofloxacin, Ofloxacin, Doxycycline, Caftazidime, Tetracycline, Ampicillin, Gatifloxacin, Azithromycin, Nitrillin, Amikacin, Gentamicin, Cefoperazone+Sulbactam, Piperacillin+Tazobactam.) and incubated immediately at 37°C and examined after 16-18 hours. After incubation zone of inhibition was in mm.



Isolated *E. coli* from urine sample Antibiotic sensitivity test

Results and Discussion:

Total 100 urine samples were collected and out of 100 urine samples 36 samples were positive for *E. coli*. Isolated 36 *E. coli* strains were subjected for antibiotic sensitivity test. Out of 36 samples 23% was reported positive for male and 13% for females. The highest number of *E. coli* infections was found in urine sample of male. Microbial sensitivity test was done using 15 antibiotics by disk diffusion test on Mueller Hinton Agar (M173) for *E. coli* as per Himedia laboratories Pvt. Ltd. Among the isolated strains of *E. coli*, 97.2 % were resistant to Cefuroxime and Cefdinir, 94.4 % resistant to Levofloxacin, 88.8 % resistant to Ofloxacin and Cephataxime 86.1 % resistant Doxycycline and sensitive to remaining antibiotics used.



Conclusion:

E. coli is the common cause of urinary tract infection. To ensure adequate treatment of urinary tract infection and reduction in the spread of bacteria resistant strain. To treat infections antibiotics are used but then is rapid spread of resistance to antibiotic. Hence it is advisable to study resistance pattern before trendy patients.

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DESCRIPTION.

(Based on Eleven specimens)

The worms were medium with scolex medium, quadrangular broader than long measures 0.737-1.078 in length and 1.361-1.417 in breadth, suckers somewhat oval, medium, four in number, arranged in two pairs at laterally measures 0.341-0.397 in length and 0.341-0.397 in breadth, rostellum medium, oval, measures 0.304 in length and 0.270 in breadth, 450-480 rostellar hooks present in a circle, neck. medium, wide, broader than long, measures 0.056-0.170 in length and 1.283-1.361 in breadth, mature segments are broader than long, three times, each with a double set of reproductive organs with lateral margins, measures 0.510-0.737 in length & 1.704-2.158 in breadth, testes 108-110 in numbers, variable, oval, situated in centre of the segment between longitudinal excretory canals, evenly distributed, measures 0.034-0.056 in length and 0.022-0.045 in breadth, cirrus pouch small, short, oval, anteriorly directed, opens marginally on each side, measures 0.056 in length and 0.034 in breadth, cirrus is thin, narrow tube, short, containing, in cirrus pouch measures 0.068 in length and 0.011-0.022 in breadth, vas deferens long, curved, runs above the ovary, measures 0.510-0.568 in length and 0.022 in breadth, ovary with irregular margins, placed middle of the segment, measures 0.136 in length and 0.090-0.124 in breadth, vagina thin tube, posterior to cirrus pouch, runs transversely, reaches and opens into ootype, measures 0.510-0.544 in length and 0.022 in breadth, ootype small, oval, measures 0.022 in length and 0.034 in breadth, genital pores small, oval, marginal, bilateral, placed anterior of segment, measures 0.022 in length and 0.034 in breadth, genital atrium small, round, measures 0.0113 in diameter, vitelline gland small, oval, measures 0.0113 in length and 0.034 in breadth, longitudinal excretory canals are measures 0.465-0.737 in length and 0.022 in breadth.

Type Species	:-	<i>Cotugnia jadhavae</i> n.sp.
Host	:-	<i>Gallus domesticus</i>
Habitat	:-	Intestine
Locality	:-	Aurangabad (M.S. India)
Date of Collection	:-	03 rd , January, 1998

Discussion:

The genus *Cotugnia* was erected by Diamare in 1893 with its type species *C. diaganophora* (Pasquale 1890) collected from domestic fowl. The present communication deals with the description of a new species *C. jadhavae* n.sp. from *Gallus domesticus* at Aurangabad, M.S. India. It differs from *C. diaganophora* in the number of hooks (450-480 as against very numerous) number of testes (108-110 as against 100-158), from *C. polycantha* in the number of hooks (450-480 as against 420) number of testes (108-110 as against 100), from *C. joyeuxi* in the number of hook (450-480 as against 250), number of testes (108-110 as against 50(30)), from *C. cuneatatenuis* in the number of hooks (450-480 as against 400), number of testes (108-110 as against 50) from *C. parva* in the number of hooks (450-480 as against 346-378) number of tests (108-110 as against 41-82) from *C. heari* in the number of hooks (450-480 as against 320-360) number of tests (108-110 as against 24-28) from *C. nerovosa* in the number of hooks (450-480 as against 300-380), number of testes (108-110 as against 22-62) from *C. bahli* in the number of hooks (450-480 as against 332) number of testes. (108-110 as against 69-74), from *C. intermedia* in the number of hooks (450-480 as against 346), number of testes (108-110 as against 63-90) from *C. noctua* in the number of hooks (450-480 as against 260) number of testes (108-110 as against 170-182), from *C. taiwanensis* in the number of hooks (450-480 as against about 1200), number of the testes (108-110 as against 12-13), from *C. rimandoi* in the number of hooks (450-480 as against 300), number of hooks (108-110 as against 100-135), from *C. magna* in the

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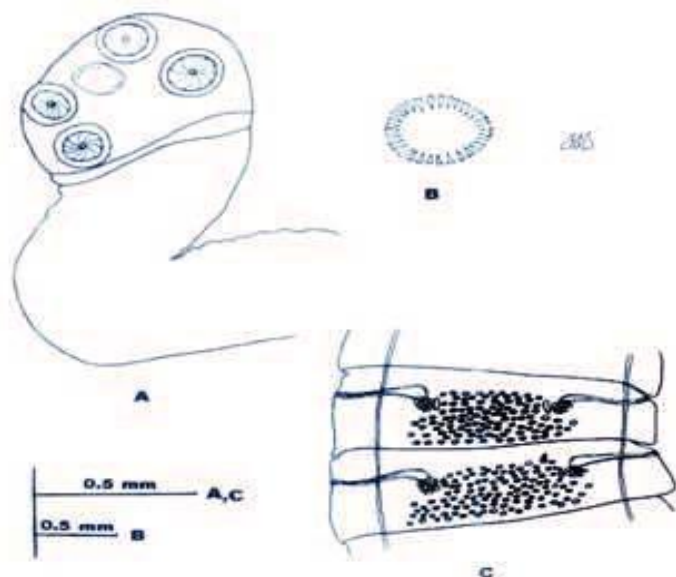


number of hooks (450-480 as against 480-500), number of testes (108-110 as against about 50), from *C. aurangabadnesis* in the number of hooks (450-480 as against 500), number of testes (108-110 as against 130-140) from *C. columbae* in the number of hooks (450-480 as against about 1200), number of testes (108-110 as against 12-14), from *C. srivastavi* in the number of hooks (450-480 as against 350), number of testes (108-110 as against 80-85), from *C. magdobi* in the number of hooks (450-480 as against 343), number of testes (108-110 as against 14-17) from *C. satpulensis* in the number of hooks (450-480 as against 337), number of testes (108-110 as against 43-92 (62)), from *C. yamaguti* in the number of hooks (450-480 as against numerous), number of testes (108-110 as against 190-200), from *C. rajivji* in the number of hooks (450-480 as against 350-400), number of testes (108-110 as against 60-65), from *C. kamatiensis* in the number of hooks (450-480 as against 200-210) number of testes (108-110 as against 95-195) from *C. chaingmaii* in the number of hooks (450-480 as against numerous), number of testes (108-110 as against 30-35), from *C. manishae* in the number of hooks (450-480 as against 110-120), number of testes (108-110 as against 85-95(90)), from *C. mehdii* in the number of hooks (450-480 as against 100-110) number of testes (108-110) as against 140-150 (145).

As there are many differentiating characters it is desirable to erect a new species to accommodate the present worm and hence the name *Cotugnia jadhavae* n. sp. was proposed in honour of Dr. B.V. Jadhav, Research guide, who has contributed a lot in the field of cestodology. The present study the collected parasites was observed with the help of keys mentioned at, Studies on the helminth fauna of Japan (Yamaguti, 1935) and Systema Helminthum Vol I, II. (Yamaguti, 1959).



Plate : *Cotugnia jadhavae* n.sp.



A - Scolex

B - Rostellum

C - Mature segment

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BEHAVIORAL ASSESSMENT OF HEAVY METAL ON FRESHWATER CRAB *BARYTELPHUSA CUNICULARIS*

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Key words: Behavioral assessment, *Barytelphusa cunicularis*, Cadmium chloride, Mercuric chloride

Abstract :

Lethal and sublethal concentrations of the two heavy metals mercuric chloride and cadmium chloride affected the general behavior, feeding behavior and the avoidance of *Barytelphusa cunicularis*. The animals exposed to mercuric chloride and cadmium chloride showed noticeable changes. The general behavior changed from the normal. The animals developed tremors and convulsions due to the stress.

Introduction:

Behavior forms the movements of body and mode of feeding. Behavior is the measure of evaluating toxicity to the animals. The action of toxicant causes stress on the organism and the behavioral changes are the immediate responses to toxicant and are indicators of possible stress.

The toxic substances even though in low concentration could alter the behavior of animal. The feeding behavior and locomotors behavior were affected when exposed to different concentration of different pollutant (Bhayyalakshmi, 1981; Deshpande, 1985). Behavioural ecology of the freshwater crab *Potamon Xuviatile* (Gherardi *et al.*, 1987). In 1989, Gherardi and Vannini observed the spatial behaviour of the freshwater crab *Potamon Xuviatile*. West *et al.*, (1991) observed the morphology and behaviour of crabs and gastropods from Lake Tanganyika, Africa. Senthil Kumar *et al.*, (2007) was studied the impact of heavy metal copper on the neurosecretory cells in a freshwater field crab, *Spiralothelphusa hydrodroma*. Houser and Epifanio (2009) observed the impacts of biochemical cues on horizontal swimming behavior of individual crab larvae. Chourpagar and Kulkarni (2011) studied the heavy metal toxicity to a freshwater crab, *Barytelphusa cunicularis* (Westwood) from Aurangabad region.

Several investigators have studied the effects of copper and other pollutants on crustaceans. The present investigation was to study the behavioral changes due to the mercuric chloride and cadmium chloride. The species *Barytelphusa cunicularis* has under taken for its economic value.

Materials and Methods:

The animals were collected from Godavari river near Aurangabad and were acclimated to the laboratory condition for 4-5 days. The animals were exposed to concentrated HgCl₂ and CdCl₂ through acute treatment. In the second set of experiments crabs were exposed to sub



lethal concentrations of 1/10 of LC_{50} of 48h of $HgCl_2$ and $CdCl_2$ for chronic treatment. The nature was changed after 12 hrs. interval with the concentration of heavy metal pollutants. The animal was constant observation for feeding response.

Results and Discussion:

The results in present investigations shows in Figure 1 and 2, that the freshwater crab *Barytelphusa cunicularis* exhibits various types of responses to the different concentration of $HgCl_2$ and $CdCl_2$ when observed for general behavior after exposure to the LC_{50} values of $HgCl_2$ and $CdCl_2$. They show different types of behavior on exposure of $HgCl_2$ and $CdCl_2$. At initial hours the prawns could not detect the change in environment but later they tried to escape by hyper activity. The animals developed tremors and convulsion. When the stress of toxicants was increased and due to further increase in stress spiral and erratic irritated swimming behavior was observed later the prawns became hypersensitive followed by sluggishness and lost equilibrium and body coloration became faint and lost equilibrium.

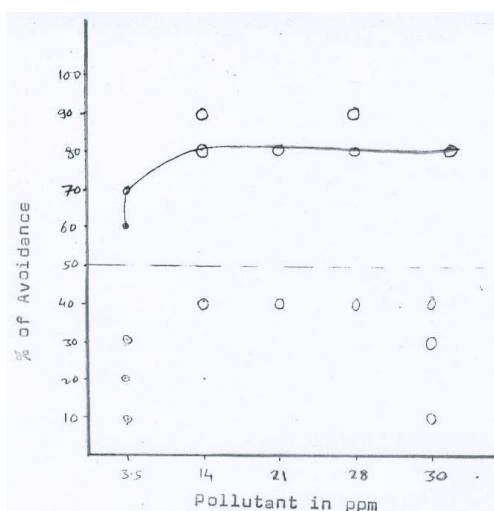


Figure- 1. Avoidance behavior of *Barytelphusa cunicularis* to various conc. of $CdCl_2$.

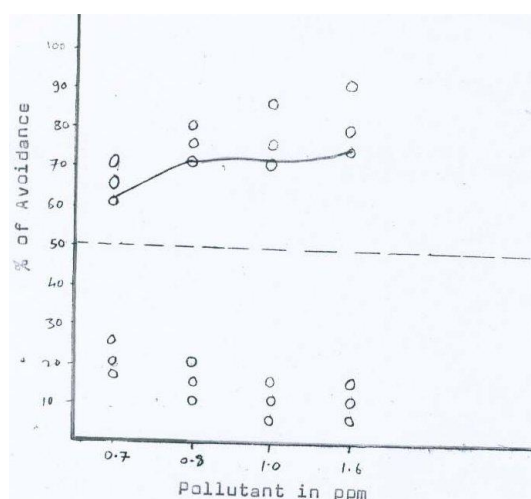


Figure- 2. Avoidance behavior of *Barytelphusa cunicularis* to various concentration of $HgCl_2$.



The above observations shows that the abnormal behavior and poisonous nature of heavy metals. $HgCl_2$ is more toxic than $CdCl_2$ depending on the concentration used. Such type of abnormal behavior was observed in marine crab *Sylla serrate* After exposure to copper DDT and Naphthalene respectively.

The avoidance response increased gradually as the time increased. They showed strong avoidance to polluted side. Behavioural Avoidance was reported by Avclin Mary *et al.* (1986). In the prawn *Macrobranchium limessii* after exposure to various pesticides studied the behavioral assessment of freshwater prawn *Caridina weberi* during antifouling organometallic stress observed the action of pesticide endosulphon is a stress on the freshwater prawn *Caridina weberi*.

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PERFORMANCE OF MANGO (*MANGIFERA INDICA* L.) CV. KESAR IN RELATION TO PHYSICAL AND ORGANOLEPTIC QUALITIES UNDER DIFFERENT PLANT SPACING AND SUNLIGHT DIRECTION.

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Key words: breadth, Plant spacing,

Abstract :

Broad spacing (10 x 10 m), medium (10 x 5 m) and Small (5 x 5m) in East, South, West and North directions influenced the growth as well as qualitative characters in Mango Cv. Kesar. The bigger length of fruit was found in North direction and in closer spacing of 5 x 5m while higher breadth was found in 10 x 5m spacing. Higher fruit weight was gained in S₃ spacing. The fruits obtained from East and South location of tree in 10 x 5m spacing trees found to be better in quality parameters.

Introduction:

In India, mango is a national fruit and pride of our fruit industry from which we can get more foreign exchange, which help us to stand our national economy (Goswami *et al.*, 1999). Besides it is considered as one of the most exotic, delicious, nutritious and popular fruit. Its taste, flavour and aroma are very fascinating built in terms of qualities and now gradually gaining the global popularization during last two decades.

Available information suggest that the concept of high density planting in mango took practical shape after development of dwarf and regular bearer mango hybrid viz., Amrapali at IARI, New Delhi (Majumdar *et al.*, 1983). In other parts of India the concept of high density in Amrapali and Dashehari found superior (Majumdar and Sharma, 1988 and Sant *et al.*, 1997). The environmental factors influence under different densities of planting on yield and quality production whereas the producers view is to achieve domestic and export market with good price. So keeping this in mind, the maximum utilization of land, light and canopy with quality produce, the rare experiment on effect of different spacing in different directions on fruit physical quality of mango cv. Kesar was carried out.

Materials and Methods:

An investigation was carried out at Regional Horticultural Research Station, ASPEE college of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2003-2004. The experiment was carried out in Randomized Block Design with factorial concept in three spacing treatments and four directions with seven replications. The main treatment was allowed according to spacing which was at 5 x 5m (S1), 10 x 5m (S2), and 10 x 10m (S3), respectively. The sub-treatments were four directions per tree viz. East (D1), South (D2), West (D3) and North (D4). The fruit quality observations were taken after the harvesting of well matured fruits. The length and breadth of each fruit were measured in centimeter (cm) with the help of digital Vernier calipers. With the help of digital balance, the fresh weight as well as the skin weight, stone weight and pulp weight were measured in gram (g) after fruit ripening. The organoleptic evaluation for assessing the colour of skin, pulp colour, taste, aroma and overall acceptability were done by a panel of five judges by using 10 points scale.

Results and Discussion:

The results and their discussion are given here according to observation –

Length of fruit

The data represented in Table-1 revealed that only spacing affected on fruit length. Significantly the maximum length (11.04 cm) of fruit was found in S1 (5 x 5m) spacing treatment and no significant results were found to direction and interaction of spacing and direction. The higher length in closer spacing



might be due to maximum vegetative growth and microclimate favored increment of fruit length. This finding was in agreement with Reddy *et al.*, (2002).

Table – 1: Response on length of fruit and Breadth (cm) to planting distance and sunlight direction.

Treatment	D ₁ (East)		D ₂ (South)		D ₃ (West)		D ₄ (North)		Mean (S)	
	L	B	L	B	L	B	L	B	L	B
S ₁ (5x5m)	10.78	6.89	10.45	6.83	11.02	6.84	11.91	6.87	11.04	6.86
S ₂ (5x10m)	10.44	7.29	10.20	7.37	10.58	7.08	11.02	7.07	10.56	7.21
S ₃ (10x10m)	10.87	6.68	11.31	6.98	10.80	7.02	10.76	6.98	10.93	6.92
Mean (D)	10.69	6.95	10.65	7.06	10.80	6.98	11.23	6.98	-	-

	S.Em ±		CD at 5%		CV%	
	L	B	L	B	L	B
S	0.062	0.062	0.176	0.176	4.717	4.717
D	0.071	0.071	NS	NS		
S x D	0.124	0.124	NS	NS		

L = Length (cm) B = Breadth (cm)

Table-2: Response on Fresh weight (g) and stone pulp ratio of Fruits to planting distance and sunlight direction.

Treatment	D ₁ (East)		D ₂ (South)		D ₃ (West)		D ₄ (North)		Mean (S)	
	W	S/P	W	S/P	W	S/P	W	S/P	W	S/P
S ₁ (5x5m)	263.33	0.843	263.16	0.822	264.11	0.737	261.03	0.755	262.90	0.789
S ₂ (5x10m)	273.77	0.897	270.06	0.858	279.87	0.778	269.78	0.708	273.37	0.810
S ₃ (10x10m)	293.07	0.905	287.35	0.869	291.62	0.765	291.73	0.748	290.95	0.821
Mean (D)	276.72	0.881	273.52	0.849	278.54	0.760	274.18	0.736	-	-

	S.Em ±		CD at 5%		CV%	
	W	S/P	W	S/P	W	S/P
S	1.340	0.004	3.784	0.011	2.572	2.625
D	1.548	0.004	NS	0.013		
S x D	2.681	0.008	NS	0.023		

Breadth of fruit

The Table-1 declares that the significant higher breadth (7.21 cm) was found in 10 x 5m (S₂) spacing and the minimum (6.86 cm) in 5 x 5m (S₁) which was statistically at par with S₃ (10 x 10 m) treatment. The similar result was found in guava fruit by Singh and Bal (2002) and Reddy *et al.*, (2002) in mango. The fruits got maximum width in S₂ (medium) spacing may be due to proper vegetative growth and favorable nutrition for fruit width increment. The similar results were received by Ingle *et al.*, (1999) in mandarin as well as Dhaliwal and Dhillon (2003) in guava.

Fruit weight

The Table-2 represents the fresh weight of fruit. The results were significant only due to the spacing. Higher fruit weight (290.9 g) was found in S₃ treatment which was followed by (273.37g) S₂ and (262.908 g) S₁ treatment. The weight of fruits obtained from S₃ treatment of spacing might be due to maximum nutrition availability to tree at wider spacing which leads to better growth of the fruit weight. (Sorbrino, 2004; Ghawde *et al.*, 2002).



Table - 3: Response of Organoleptic Score of Fruit to Planting Distance and Sun light Direction

Treatment	Colour of Skin					Pulp colour					Taste					Aroma					Over all acceptability				
	D ₁	D ₂	D ₃	D ₄	Mean (s)	D ₁	D ₂	D ₃	D ₄	Mean (s)	D ₁	D ₂	D ₃	D ₄	Mean (s)	D ₁	D ₂	D ₃	D ₄	Mean (s)	D ₁	D ₂	D ₃	D ₄	Mean (s)
S₁ (5x5 m)	6.45	7.32	7.25	7.15	7.043	7.17	7.19	7.27	7.23	7.214	7.07	7.17	7.28	7.10	6.99	7.03	7.09	7.23	7.00	7.086	7.04	7.17	7.28	7.10	7.147
S₂ (5x10m)	8.00	7.81	7.43	7.32	7.640	7.89	7.38	7.37	6.92	7.391	7.82	7.58	7.39	7.10	7.53	7.59	7.37	7.33	7.41	7.425	7.82	7.58	7.39	7.10	7.473
S₃ (10x10m)	7.51	7.35	7.62	7.27	7.440	7.53	7.11	7.33	7.31	7.321	7.54	7.32	7.47	7.35	7.43	7.56	7.58	7.31	7.08	7.383	7.54	7.32	7.47	7.35	7.421
Mean	7.32	7.50	7.43	7.14	-	7.53	7.22	7.32	7.15	-	7.41	7.31	7.41	7.14	-	7.39	7.34	7.28	7.16	-	7.46	7.35	7.38	7.18	-
	S.Em ±		CD at 5%		CV %	S.Em ±		CD at 5%		CV %	S.Em ±		CD at 5%		CV %	S.Em ±		CD at 5%		CV %	S.Em ±		CD at 5%		CV %
S	0.0503		0.142		3.61	0.0458		0.129		3.32	0.050		0.141		3.615	0.0759		0.214		0.50	0.0502		0.141		3.61
D	0.0581		0.164			0.0530		0.149			0.058		0.164			0.0876		NS			0.0580		0.164		
S x D	0.1007		0.284			0.0918		0.259			0.100		0.283			0.1518		NS			0.1004		0.283		

D₁ = East, D₂ = South, D₃ = West, D₄ = North

Stone Pulp ratio

The Table –2 denotes that the stone pulp ratios were found significant due to different spacings and directions. The significantly minimum score (0.789) for spacing was found in S1 while maximum (0.821) in S3 and S2 (0.810) spacing. The directionally effect also shows clarity with stone pulp ratio. The higher stone pulp ratio (0.881) was noted in D1 direction followed by D2 (0.849), D3 (0.760) and D4 (0.736). In interaction the significantly minimum (0.708) stone-pulp ratio was found in D4S1 treatment which was followed by D3S1 and D4S3. The lower stone-pulp ratio in closer spacing might be due to impact of spacing and shade effect. The ‘Baneshan’ mango was also showed the lower stone pulp ratio in less specific gravity fruits (Narayana *et al.*, 1999).

Organoleptic score

The table-3 reveals the quality characters of ‘Kesar’ mangoes as a organoleptic score. In case of skin color of fruit highest score (7.64) received by S2 spacing, in direction (7.50) in D2 directions and interactionally maximum score (8.00) received by D1 direction of S2 spacing. The pulp color also got maximum score (7.391) under S2 spacing and in (7.53) D1 direction and in interaction D1 direction and D2 spacing gave maximum score (7.89). The taste character was scored maximum (7.53) in S2 spacing and in D1 direction at 7.41. In aroma only spacing significantly received maximum score (7.425) in S2 spacing. The overall acceptability score was maximum (7.473) in S2 spacing, (7.468) in D1 direction and ultimately the interaction effect was significant in S2 spacing and in D1 direction of score 7.82. All the qualitative characters found maximum in S2 spacing and in D1 direction might be due to availability of suitable medium of environment in spacing S2 and in D1 directions. The temperature around the fruit and sunlight would be helpful in termination B-Carotene (a color pigment) (Gunjate *et al.*, 2004, Sorbrino, 2004 and Singh and Bal, 2002). The microclimatic effect on East and South direction and maximum exposure to sunlight (Sharma *et al.*, 1997) might be improved the quality of fruits. The medium spacing S2 (5 x 10 m) and D1 (East) direction gave maximum response to all physical quality characters and was supported in other fruits also (Sharma *et al.*, 1997).

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- VERMICOMPOSTING OF TENDU LEAF LITTER IN SOLAPUR CITY .**
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Key words: *Diospyros melanoxylon* , Tendu, Vermibiotechnology, Vermicomposting

Abstract :

The earthworms act as soil engineers. They enhance and rejuvenate the fertility of the waste for sustainable agriculture. Tendu (*Diospyros melanoxylon*.Roxb) leaf litter waste produced from the beedi industry of Solapur is a great problem .This project is a process of production of “Wealth from Waste” which is economically profitable and environmentally friendly. Vermibiotechnology is properly used for recycling of organic part of solid beedi leaf litter waste in a very profitable way by composting and vermicomposting in the scientific manner. The vermicompost produced from the beedi waste has all the important growth promoting gradients which help in boosting of agricultural crops.

Introduction:

Solapur District is a commercial city in south western Maharashtra, India and famous for textile and beedi industries. Tendu (*Diospyros melanoxylon*) leaf is used for wrapping up of tobacco to make beedi (Indian cigarette). Only 40% of the leaf is used for making beedi and the remaining 60% is thrown as waste on the streets . The method of employing earthworms in converting the organic matter present in the waste is widely known as vermicomposting. It is a process involved in the degradation of organic waste into useful components. It is a natural process in which the earthworms play a major role in the degradation (Edwards,1998).

In the present investigation an attempt has been made to study the vermicompost produced from the tendu leaf litter using exotic earthworm species, *Eudrilus eugeniae*.

Materials and methods:

In the present investigation the tendu leaf litter was used as organic raw material (ORM) to recycle the waste into manure. The leaf litter is abundantly available in Solapur as the city is famous for beedi making. Five hundred kilograms of tendu leaf litter is collected from beedi making industries. It is powered by using mechanical pulverizer and decomposed. The decomposed material is transferred into raised bed of size 6mx 1m x 0.5m .Twenty five thousand earthworms belonging to species *Eudrilus eugeniae* were introduced into the bed of standard size. During the experimentation temperature and moisture were maintained. The nutrients in the vermicompost are analyzed using standard methods.

Results and Discussion:

The Carbon content in the vermicompost decreased as compared to the control. The decrease in the carbon may due to its combustion and this might have led to increment of other nutrients. The





results shown in Table-1. The C: Ncontent in the vermicompost decreased as compared to the control. The Nitrogen content in the vermicompost increased as compared to the control. The earthworms accelerate the nitrogen mineralisation process and thus led to increase in nitrogen profile. The phosphorus content in the vermicompost increased as compared to the control. This may be attributed to the increase of phosphate solubilising bacteria in the vermicompost. The potassium content in the vermicompost increased as compared to the control. Kafle *et al.*, (2009) studied the composting of water hyacinth (*Eichhornia crassipes*) and concluded that the compost obtained by water hyacinth has acceptable composition of NPK and can be used in agricultural land for crop production. Sannigrahi (2009) studied management of aquatic weeds through vermicomposting and highlighted that vermicompost is a beneficial technique; better than expensive chemical and biological control technique. Mushan (2009) has studied a detail account on conversion of beedi industrial waste generated in the form of tendu leaf litter into a biofertiliser and studied its impact on the productivity of a commercial crop, *Allium cepa* (Onion).

Table:1 Chemical properties of vermicompost compared with control (decomposed tendu leaf litter)

	C	C:N	N	P	K
Control	30±2.77	24.3±3.44	1.26±0.05	0.85±0.08	0.96±0.12
Vermicompost (<i>E.eugeniae</i>)	23.81±2.13	18.47±2.22	1.38±0.09	1.38±0.04	1.65±0.12

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ICTHYOFAUNA OF BARAZGIR RIVER NEAR KHERAZOOK VILLAGE, ERBIL GOVERNORATE, NORTHERN IRAQ

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Key words: Cyprinidae, Mastacembelidae, Ichthyofauna, Sisorsidae

Abstract:

A total of 12 species of fishes were identified from several collections carried out in Barazgir river the period between 2010 and 2011. These fishes are belonging to three families namely: Cyprinidae, Sisorsidae and Mastacembelidae. Among Family cyprinidae *Alburnus mosulensis*, *Aspiux vorax*: *Barbus barbulus*, *Capoeta barroisi*, *Capoeta trutta*, *Chondrostoma regius* *Cyprinion macrostomus*, *Garra rufa*, *Garra variabilis*, *Squalius cephalus* were identified. A subspecies of *Capoeta barroisi* was erected due to the presence of one pair of barbells, and is designated as *Capoeta barroisi kherazooki* subsp. N. From Family: Sisorsidae only one species was identified, *Glyptothorax kurdistanicus*, while from Family Mastacembelidae one species was recovered, *Mastacembelus mastacembelus*. All species recovered considered as new records for this region as this study represent the first one on the fishes of Barazgir river.

Introduction

Researches on Iraqi freshwater fishes started as early as the 19th centuries. (Russeger Reisen 1843; Heckel 1843; Berg 1931; Misra 1947 and Menon 1960). Khalaf (1961) and Mahdi (1962) they both published books on fishes of Iraq. Some other scattered reports were also published later on (Trewavas 1955; and Mahdi 1971; Banister and Bunni, 1980). Al-Daham (1977; 1979 and 1984) published three books on Fishes of Iraq and the Arab Gulf. Al-Daham (1982) gave a check-list of ichthyofauna of Iraq and Arab gulf. Al-Rudainy *et al.* (2008) published an atlas of Iraqi freshwater fishes. Recently Coad (2010) wrote a very comprehensive study on freshwater fishes of Iraq with a proper keys and valuable information and logical comments. In all the above literature there was no any study to cover the fishes of Barazgir River near Kherazook village, in Kurdistan region as such this study was conducted.

Materials and Methods:

Gill nets were used to capture the fishes from the River Barazgir near Kherazook village which located in (N 36 57'36" and E 044 19'19") (see map attached figure 1).

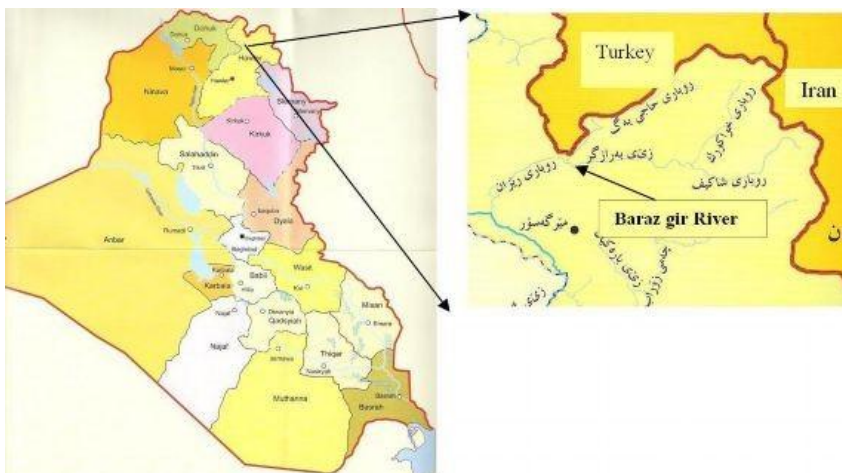


Figure (1); Iraqi map with Barazgir River near Kherazook village

This river originated from boundaries of Iran and Turkey and precisely from two springs one near Kani Neer and the other near Faqe Wasman, these two branches then united near Faqeean to form Barazgir river. Barazgir river later on joins the Great River Zap near Bakhma dam, then continues to pour into Tigris River southern of Mosul city. The captured fishes were then examined grossly when they are fresh, then preserved in 10% formalin and brought to the laboratory of Kurdistan natural history museum in Erbil for further study. Externally all fishes examined for their mouth opening, lips, fins, rays in the fins, spines in the fins, lateral line scales, total and standard length and other parameters.

Remarks and Comments

Family: Cyprinidae

Most spacious in Iraqi freshwater fishes, the species recovered were:

***Alburnus mosulensis* Heckel, 1843 (Plate 1)**

Five specimens were examined, their total length and maximum width 11 x 2; 11 x 2; 12 x 2; 12 x 2.1; 12.5 x 2.2 cm; body elongated and compressed, lips thin, mouth small and transverse, with dark, lead-colored stripe runs along and above the mid-flank, stripe more evident posteriorly. Al-Daham reported that this species is present in little and Great Zap Rivers and Al-Khaboor while Al-Rudainy *et al.* 2008 reported that it is present in upper parts of Euphrates River especially in Haditha dam lake, Dokan Dam Lake and Shat al- Arab. As it is reported from Great Zap so its presence in Barazgir River, which is its tributaries, is expected.

***Aspiux vorax* Heckel, 1849 (Plate 1)**

One specimen was collected and examined; total body length 17 cm maximum width 3.5 cm. body elongated it is distinguished by small scales on the body, distinct hump after head, dorsal fin originated anterior to the pelvic fin, no thickened ray, long anal fin oblique mouth with lower jaw projecting; no barbells, lateral line scales 85, the back is blackish, the overall is silvery gray, It has been reported from many rivers, ponds, little zap in Iraq (Mahdi and Georg, 1969; Al-Daham, 1977; Al-Rudainy *et al.*, 2008) but not from the Great zap (Coad, 2010), its type locality is Tigris river (see Al-Daham, 1977) as such it is the first report from the Barazgir river which pours into the Great Zap.

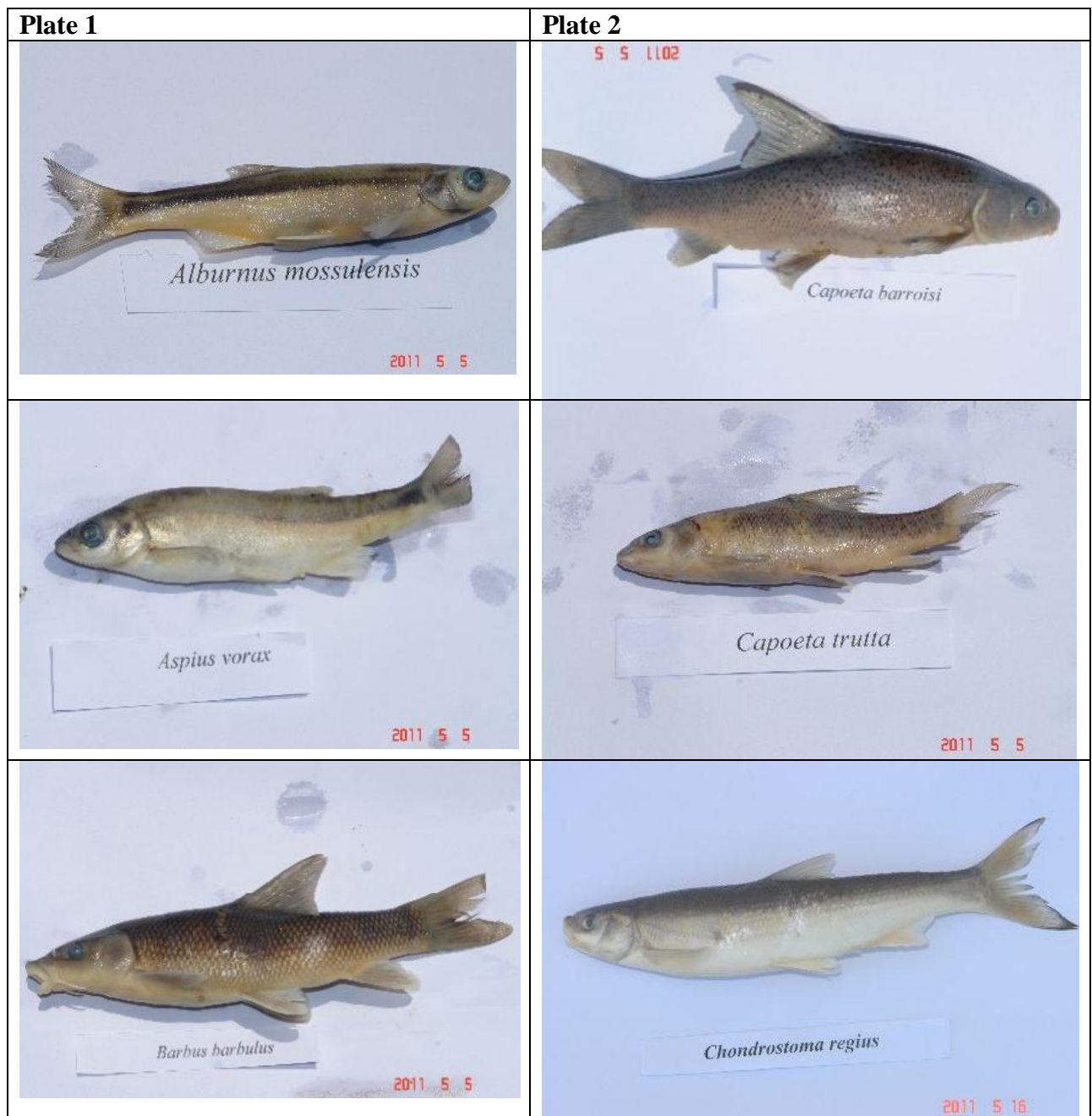
***Barbus barbulus* Heckel 1849 (Plate 1)**

Four specimens were examined, total length and maximum width: 13 X 3, 14 x 3.5, 15 x 3, 16 x 3.8 cm mouth inferior, two pairs of barbells; one long and the other short, eyes large, thick fleshy lips in some specimens with a very distinct median lower lip lobe, a serrated and strong dorsal fin spine, lateral line scales 50-56, upper flank scales are outlined with pigment, color of back is brownish and belly whitish, caudal fin homocercal. This species reported from many rivers, lakes, marshes, streams little zap, Habbanyiah and Himrin dam (Al-Daham 1977; Al-Rudainy *et al.*, 2008 and Coad, 2010) but not reported previously from Great zap which is Barazgir river is one of its tributaries as such this is the first report from Barazgir River.

***Capoeto barroisi* Lortet in Barrois, 1894 (Plate 2)**

Eight specimens were examined; 14 x 3.5, 16 x 3.8, 18 x 4.5, 19 x 4, 20 x 5, 21 x 3.5, 24 x 4.5, 24 x 5 cm., standard length 3.3 – 4.5 of body length; deep body mouth more horseshoe shape, one pair of barbells at angle of lower jaw with upper jaw, large eyes, double nostril opening, dorsal fin with 3-4 unbranched and 8-10 branched rays; pectoral fin branched rays 15-16, lateral line scales 60-70; body silvery-white the belly is yellowish. Al-Rudainy *et al.* (2008) reported this species from both little and Great Zap while Coad (2010) reported it from little Zap only. The remarkable characters which may distinguish these specimens is the presence of one pair of barbells

which were not reported by other authors (Al-Daham 1977; Al-Rudainy *et al.*, 2008 and Coad, 2010), as such this species a subspecies can be erected and designated as *Capoeta barroisi kherazooki* subsp.n.



***Capoeta trutta* (Heckel, 1843) (Plate 2)**

Total length of a specimen examined 12 x 2.8 cm, small eyes, small body scales, transverse mouth, two pairs of barbells, the second is longer, very strong last unbranched dorsal fin ray, body covered with a small black spots, the color pattern of this species help in its identification, lateral line scales more than 50. It has been reported for the first time by Heckel, 1843 then Khalaf (1961); Al- Daham, (1977). Al-Rudainy *et a.l* (2008) and Coad (2010) reported it from little and Great zap, as such its presence in Barazgir river is expected.

***Chondrostoma regius*, Heckel, 1843 (Plate 2)**

Two specimens were examined 25 X 4.8 , 24 X 4.5 cm, moderate size, slightly compressed body, scales moderate in size, lateral line scales 60-64, no barbels, inferior and slightly arched mouth cleft, with thick horny layer on lower jaw, the back is olive-brown in color while belly is white; fins are white orange in color especially the caudal fin. Numerous tuberculation were seen in head of one specimen .This species has been reported to present in Euphrates and Tigris, Little and Great zaps (Coad, 2010) so its presence in Barazgir river is expected.

***Cyprinion macrostomus* (Heckel, 1843) (Plate 3)**

Four specimens were examined , their total lengths 15.0 x 5, 16 x 5, 16.8 x 5.1, 17 x 5.2 cm ; moderate body size, compressed the standard length is 3- 3.5 of body depth, the snout blunt and thick, mouth wide and inferior, one pair of short barbells, origin of dorsal fin is anterior to pelvic fin, scales are moderate in size, lateral line scales 37-39, tuberculation is present in three specimens especially at their posterior-lower half of the body and absent in the small specimen (15cm).it has been reported in Great and Little Zap (Coad, 2010) as such its presence in Barazgir river is expected.

***Garra rufa* (Heckel, 1843) (Plate 3)**

Three specimens were examined, 7.5 x 0.5, 11 x 2, 13 x 2.2 cm; the adhesive disc is well developed with free anterior margin, mouth ventrally located, two pairs of barbells, color is brownish-olive to dark green, most of the body blackish, lateral line scales 31-35. Both Al_Rudainy *et al.* (2008) and Coad (2010) reported this species from both Little and Great Zap; as such its presence in Barazgir River is expected.

***Garra varibalis* (Heckel, 1843) (Plate 3)**

Three specimens were examined, 6.5 x 1.5, 10.5 x 2, 11.5 x 2 cm, single pair of maxillary barbells, absence of free anterior margin, weakly developed adhesive disc on the lower head surface, lateral line scales 37-40, color brown- olive to gray with darker mottlings and lighter belly. It is only reported from Tigris River at Mosul and Baghdad (Coad, 2010) while AL-Rudainy *et al.* (2008) did not present in his atlas, and Al-Daham (1977) do not mention any specific site of its presence. However, its presence in the Great Zap is to be investigated. It is noteworthy that its occurrence in Barazgir river represent a new location of this species in Iraq and its presence in Great zap is doubtful as such further investigation seem necessary to trace its occurrence in Iraqi territory and find a possible relation to other species of *Garra* such as *Garra widdosoni* (see Trewavas, 1955; Banister and Bunni, 1980).

***Squalius cephalus orientalis* (Linnaeus, 1758) (Plate 4)**

One small fish was examined 11.5 x 2 cm, relatively large scales outlined by pigment give the fish a distinctive character, absence of barbells, rounded belly, and color silvery to grey. Al-Rudainy (2008) reported that this species is rarely collected from Tigris and Euphrates rivers, but Al-Daham (1977) and Coad (2010) reported this species from Great and Little Zaps, as such its presence in Barazgir river is expected.

Family: Sisorsidae

Only one species was reported from this family:

***Glyptothorax kurdistanicus* (Berg, 1931) (Plate 4)**

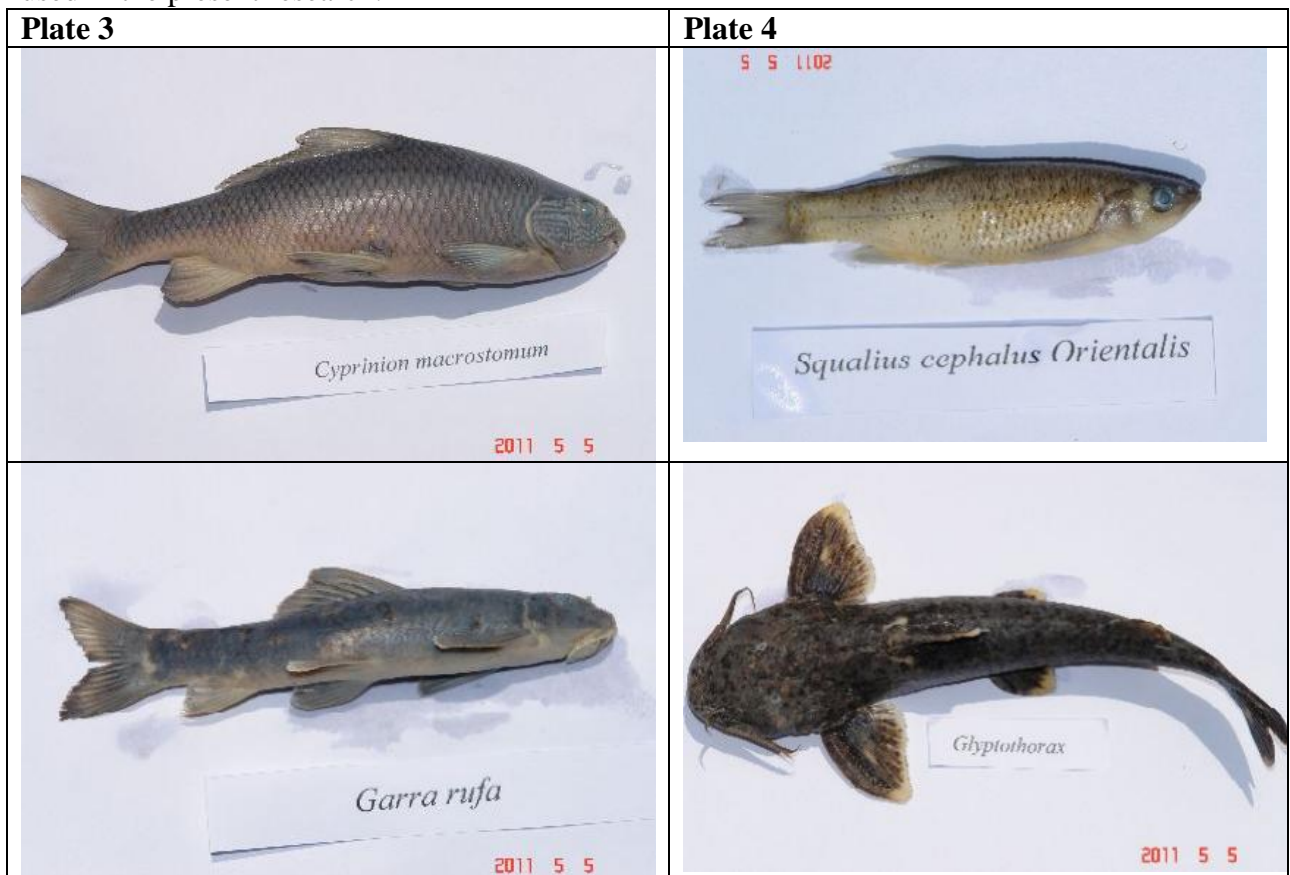
One specimen was examined, 23 x 5cm, broader than long adhesive apparatus 4.5 x 3.5 cm, no pinnate lateral branches, caudal peduncle short, flattened head, short dorsal fin with strong spine 4 pairs of barbels, maxillary barbels broadly based, mouth transverse 3.5 cm width and inferior, eyes small and partly obscured by skin, color grey to brown with large obvious round black spots

and blotches on the sides or small round black spots. Some peculiar characters are present in this species such as the presence of two white spots on the caudal fin, which may be some variations related to habitat. It is important to note that Al-Rudainy (2008) did not show in his atlas, while Coad (2010) reported it from Little Zap but not from the Great Zap, but this represents the first report from Barazgir river which is a tributary of the Great Zap and its occurrence in the Great Zap needs further research.

Family: Mastacembelidae

***Mastacembellus mastacembelus* (Banks and Solander in Russell, 1794) (Plate 4)**

Two specimens were examined total length 45 X 4, 50 X 5 cm, eel-like, elongate and compressed body, inferior mouth, small eyes, scales minute and cycloid lateral line present, rounded caudal fin, sharp dorsal spine 31 in number, snout tip flexible snout flanked by tubular nostrils, pelvic fins absent. Al-Daham (1984) reported this species from Tigris and Euphrates. In Mosul during parasitological investigation it has been collected from margins of River Tigris passing through Mosul city (see Rahemo, 1989). It is reported by Coad (2010) in both Little and Great Zap so its presence in Barazgir river is expected. Al-Rudainy et al (2008) restricts its presence in Euphrates River. It is noteworthy that this species of eel has given the name *Mastacembelus simach* Ladiges, 1964 while Mahdi 1962 gave the name *Mastacembelus mastacembelus* Mahdi, 1962 but as a recent publication of Coad (2010) gave the latter name, it is used in the present research.





Acknowledgement

It is with great pleasure that we acknowledge the help given to us by fisherman, Mr. Ali Mahmood (native of Kherazook village) who helped us in capturing all fishes from Barazgir river during the course of our study.

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ECONOMICS AND ECOLOGY OF BIO RESOURCES: VITAL CONCERNS

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Key words: Cyprinidae, Mastacembelidae, Ichthyofauna, Sisorsidae

Abstract:

Scholars and scientists have brought into focus both developmental and ecological concerns, and suggested how 'economic-political-technological systems' can be rooted in values for the optimum use of natural endowments. Bio-resources should be used not abused. Man should synchronize need and greed and maintain nature's equilibrium as admonished by the Vedic seers. Economic development should not mean ecological disharmony.

Man is said to have the insentient mind of inanimate beings, the vitalic mind of the plant kingdom, the conscious mind of the animal kingdom, besides having his own self-conscious identity which yearns for progress and development (Benjamin Walker, 1977) the quality of his life depends, more or less on the proper development, maintenance and utilization of bio-resources.

Yet mankind needs to partake of nature's bounties in the manner of a child who lovingly and gracefully gets the best of his mother. Bio-resource engineering must be rooted in ethics so that humans do not kill the proverbial hen which laid a golden egg a day. Ecology and development can blend if man realizes that he is a part of nature's mechanism, and that his destiny lies not in over-utilizing or degrading its resources but in making a judicious use of them. In the light of global warming or global cooling trends, heavy growth of algae in rivers and lakes, changing seasons, thinning of ozone layer and other threats to life-supporting systems, humanity faces the existential question of choosing between progress sans ecological balance and progress in synergistic relationship with the universe.

Fisheries, sericulture, apiculture, vermiculture, dairy science etc. have immense commercial potential. But the economics of zoology should not be the dilution of ecology. The Vedic culture adheres to the principle of shared membership of all living organisms as is evident from the Vedic prayer:

May all beings look on us with the
Eyes of a friend;
May I look on all beings with the
Eyes of a friend;
May we look on one another with the
Eyes of a friend (Yajurveda by Satya Prakash Saraswati and Uday Vir Viraj, 2009).

Mankind today faces an ecological crisis of the worst nature. By indiscriminately cutting down forests, converting grasslands into areas of habitation, levelling and tunneling mountains, changing landscapes, destroying ecosystems, generating chemical and radioactive pollution, producing non-biodegradable matter, endangering plant and animal species and dumping lakes, rivers and oceans with sewage and industrial wastes, man has disturbed the balance of nature and created conditions which, if not altered for the better, can prove to be disastrous for humanity. Marching on the developmental path, he has forgotten the consanguinity between all living beings and between material and moral concerns, and as a result, plundered natural resources.





The fact that life in its varied forms and manifestations is interdependent and interrelated was emphasized by the Vedic *sages* centuries before ecological problems became a matter of serious concern for humanity. Holy men who lived in close communion with nature were aware that disturbances in the biological equilibrium between different organisms and their environment would affect the quality of life, or may even destroy it. They sensed the rhythmic flow of energy in every object of nature - in heavenly bodies, rivers, oceans, plants, animals, birds and insects - and stressed the need for the preservation of life which, in its various moulds and aspects, emanated from the same *Reality*. From the fundamental premise of the oneness of existence ensured a *reverential attitude* towards the objects of nature and a *holistic view* of life and of progress.

The Vedic seers spoke of the Cosmic Order (*ṛta*) which was rooted in the changeless *Reality*. At its bidding the wheel of time moved, celestial bodies marched on their determined course - the sun and stars shone in the sky, the moon reflected the sun's rays, the earth spun on its axis, water flowed, air blew, fire emitted heat and light, seasons revolved, eclipses occurred, and days and nights followed each other in an unending cycle.

Metaphysically speaking, *ṛta* (Cosmic Order) and *Satya* (Truth) are twins since they emerged out of *tapas* (blazing spiritual fire) in the beginning of creation. Together, they uphold the heavens and the earth Chaubey (1970). *Ṛta* is the manifest form of the Cosmos; *Satya*, the inherent principle of *ṛta* and *Dharma* (in the sense of righteousness) is the ideal order in the human world. The absence of *ṛta* or *Satya* brings about chaos and disorder. It is the infringement of the Moral Law - the disturbance of equilibrium between various elements in nature by man - which has caused the ecological crisis.

The gluttonous nature of man needs to be checked for purposeful living in the present and sustainable development for the future. The earth is conducive to the welfare of man if he adheres to the Cosmic Law, says the *Rgveda* (I. 91.7). The judicious use of oceans, forests and atmosphere, the key components of the earth's environment, is the *sine qua non* for preserving its ecosystem and saving life from being undermined. The prophetic note in a Vedic hymn reveals the ecological concern of the sages of yore:

‘O death, we pay homage to thee from saving us from the scientific weapons of the learned, from the instruments and arms of the king, and from the economic troubles created by businessmen.’

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Mitrasyaham chakshusha sarvani bhutani samikshe.

Mitrasya chakshusha samikshamahe.

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