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STUDIES ON WATER QUALITY AND PLANKTON POPULATION OF MAHESHARA LAKE OF GORAKHPUR DISTRICT (U.P.)

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ABSTRACT

Income from capture fishery is the main source of livelihood of some of very poor community and its depends upon rivers of the district, their connecting tributaries, nallas, Lakes and irrigation channels and a good number of seasonal and potential tanks. In present study the physcio-chemical parameters shows a remarkable variation observed in all sampling sites of Maheshara lake. 17 and 23 species of phytoplankton and zooplankton are also observed in all sampling sites, respectively. It is obvious that water bodies and aquatic organism (such as major food fishes, plankton and other invertebrates) of this lake are under threat and needs urgent strategic conservation effort. The present study will be helpful to (a) conserve the valuable indigenous species, (b) enhance the income of local communities and (c) increase the weight of national food basket.

Key Words : *Water quality, plankton, population, Maheshara lake.*

Today aquaculture is being projected as possible solution of food problem faced by peoples. Higher aquaculture production can be achieved by the body of the better water quality, because water quality plays an important role in aquaculture (Sinha and Srivastava 1991). At present industrialization and other human activities are continuously polluting water bodies and handling their beneficial uses (Sinha, 2007; Shahi, 2010).

Several reports have been available on the physico-chemical characteristics of lakes, pond and river water in India (Shukla and Panday 2001, Singh and Singh 2004). The threat to the lake comes mainly from the residential colonies that have developed around the lake. According to the report of Gorakhpur environmental action group, around 800 quintals of wastes are dumped into the lake everyday from these colonies. Moreover, the waste is also dumped in and around the lake, resulting in foul smell. Lake pollution is a serious water pollution problem, which needs concern, as it is known that a lake is less self assimilating than flow river water. Also the stagnant water in the lake can only undergo aerobic purification, which is low process.

The Maheshara Lake about 60 hectare is a natural lake slightly attached with river Rohini, which is a tributaries of Main River Rapti of Gorakhpur district. The waste from households contains nitrate and phosphate, which results in eutrophication, leading to low oxygen content in the lake. The lake is leading from euthrophic condition to hyper-eutrophic condition. In May 2009, it was reported that the pH of the lake had become acidic (pH content recorded to be 11.5) and the temperature of the lake had also increased. Availability of better quality of fresh water in this lake is important because it provides employment to local fisherman and main source of livelihood of some of very poor of this area.

A review of literature indicates that earlier this lake was not polluted but since last 10-15 years, the lake was considered to be polluted (Singh and Singh, 2004). Due to the urbanization of the area, the lake receives huge amount of domestic sewage, agricultural waste, industrial effluents and municipal waste. No attention has even been paid to assess the depletion of fish resources in this lentic lake of Gorakhpur due to anthropogenic activity. The present study has been under taken to assess the recent seasonal variation in the some important physico-chemical parameters and planktons in water sample collected from different sites of the Maheshara Lake.

MATERIALS AND METHODS

The study carries out for a growth period of 12 months from Nov.2006 to Oct.2007 .The water samples for biological studies were taken from the subsurface in plastics bottles on monthly basis. The water samples for planktons study were preserved by using 4% formalin solutions. Battish, 1992.and examined under a microscope using 10 X ocular 10 X and 40 X objectives (MakeL: Olympus). The identification of phytoplankton's and zooplanktons up to generic level were done with the help of following literature (Ward and Whipple 1959 APHA1989, Tonapi 1980, Battish 1992 Fritish 1979).

The Maheshara Lake is divided in 4 sampling stations. These **sampling sites** are: Site 1: Collected effluent from village area Site 2: Near Railway Bridge collecting effluent from domestic sewage Site 3: Washer men's point Site 4: Junction of river and lake.

Collection of Sample:

Water: Water sample are collected early hours of day i.e. between 7.30AM to 9.00 AM and hydro biological parameter are check by APHA (1998) and water analysis kit (Makle: Centuary).

Planktons: Planktons are collected early hours of day i.e. between 7.30 AM to 9.00 AM with the help of plankton net and the qualitative estimation of planktons by Sedgwick- Rafter Cell method.

RESULTS AND DISCUSSION

The variation observed in most of the physical parameters at all sampling sites. There is monthly variation in pH of water. It's ranged from 7.10 to 8.04. The pH of site3 is higher than other sites in month of March & April, when there is no rainfall. The pH of site 4 is minimum in month of March. The fluctuation of pH in different sites shows variability in CO2 & temperature. Value of biological oxygen demand of water at four experimental sites of Maheshara Lake is range between 4.1mg/l to 7.9 mg/l. There was highly significant difference in BOD between months. Maximum value of BOD is observed in March to June. Monthly variation in chemical oxygen demand of four different sites of Maheshara Lake is also observed. The value of COD is ranged from 2.01 to 6.1 mg/L. Where monthly variation as well as seasonal variation is found The Significant difference in value of COD is observed from site 1 to site 4. Where minimum value 2.01mg/l and maximum value is 6.1 mg/L of the same month March. Another important physico-chemical parameter is dissolved oxygen of water play a key role in analysis of water quality. There is great fluctuation is observed from site 1 to site 4 through out all the studied months. DO range between 4.4 mg/l to 11.9 mg/L. where the maximum value is in month of Nov. The hydro biological features of the collection centers also play an effective role in fisheries output to a greater extent.

Phytoplankton population observed at different sampling sites of Maheshara lake water during Nov. 2006 to 2007 sites. In present study 17 and 23 species of phytoplankton and zooplankton are observed all sampling sites, respectively. In which member of Cyanophyceae and chlorophyceae were maximum in all sites.

In the present study Phytoplanktons were most abundant as compared to Zooplanktons, the members of Cyanophyceae, Chlorophyceae and Bacillariophyceae were present in two sites except 1& 2. The member of Cyanophyceae was present in all sites.

Table.1: Variation in Hydrological Parameters of Maheshara Lake during Nov. 2006 – Oct. 2007

	Site	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct
pH	1.	7.7	7.4	7.4	7.3	7.4	7.2	7.4	7.3	8.2	7.5	7.6	8.1
	2	7.8	7.2	7.1	7.3	7.0	7.6	7.2	7.1	7.6	7.8	7.9	7.9
	3	8.04	8.0	8.0	8.0	8.0	8.0	7.4	7.5	7.9	7.3	7.4	7.3
	4	7.82	7.6	7.4	7.6	7.03	7.41	7.6	7.1	8.0	8.0	8.1	8.5
DO	1	9.2	10.	7.4	8.4	8.2	9.6	9.4	9.6	9.0	9.2	10.	7.8
	2	5.89	5.2	4.4	5.4	6.4	6.3	4.9	4.7	4.7	5.01	5.0	4.4
	3	5.4	6.2	5.0	4.8	5.28	5.8	4.7	4.6	4.6	5.4	5.2	4.7
	4	11.9	11.	9.2	10.	11.4	8.2	8.4	11.3	11.1	11.9	10.2	11.2
BOD	1	5.6	6.6	4.1	6.4	4.8	5.2	6.4	6.2	6.4	6.02	5.2	6.5
	2	7.2	7.4	6.4	6.0	7.1	7.2	7.8	7.6	5.8	6.8	7.4	7.3
	3	6.8	7.1	6.5	6.6	6.2	7.1	7.9	7.8	7.3	6.7	6.4	7.1
	4	5.9	4.6	4.2	5.2	6.4	5.1	4.9	5.4	6.3	5.2	4.6	5.6
COD	1	2.2	2.1	4.3	2.2	2.01	2.30	2.21	2.1	2.0	2.2	2.1	1.9
	2	2.5	2.3	4.5	4.5	4.6	2.40	2.21	2.2	2.4	2.5	4.6	2.3
	3	5.6	5.4	2.3	4.2	6.1	2.30	3.28	6.5	5.6	4.9	3.8	3.9
	4	2.67	2.2	2.1	2.4	2.90	2.02	1.86	2.1	2.12	2.91	2.8	2.1
CO_2	1	22	14	12.	22	22	18	19	14	14	15	20	21
	2	18	14	16	18	20	15	21	11	20	19	17	18
	3	16	8.0	8	10	15	9	13	12	15	16	18	19
	4	20	12	12	14	16	10.5	12	10	18	17	15	20
Cl_2	1	22	21	20	21	23	22	25	18	17	16	18	14
	2	15	17	18	16	19	20	22	16	14	13	14	16
	3	19	15	16	18	21	19	20	15	19	17	16	13
	4	13	12	14	13	15	16	18	13	12	12	15	14

Site 1: Collected effluent from village area **Site 2:** Near Railway Bridge collecting effluent from domestic sewage **Site 3:** Washer men's activity **Site 4:** Junction of river and lake.

Among zooplanktons Protozoa was present in all months. Rotifers were rich in genera through out the study period among algae Chlorophyceae were the most abundant through out the study period. The decrease in Cyanophyto may be due to low concentration of organic matter, high level of CO2 and high pH (Boyd, 1981). Cyanophyceae were inversely related Chlorophyceae (Shepherd and Bromage, 1992). Oxygen play very important role in determine the potential biological activities can occur only within narrow range (Shepherd and Bromage, 1992). The favorable range of pH 6.5-9.0 at any day break, are most suitable for fish penetration (Boyd and Tucker, 1998). In present study 7.2-7.9, this indicates that the water is suitable for fish production. pH showed seasonal fluctuations between the favorable range throughout the study period which may be due to increase or decrease in carbon dioxide.

Dissolved oxygen showed maximum value in winter season. It may be due to temperature variation. DO showed inverse relationship with water temperature (Boyd, 1981). The maximum DO was observed in Nov. when the temperature is minimum. The Chemical oxygen demand measures the organic portion susceptible to oxidation by strong chemical oxidant, usually potassium dichromate. According to Steel and Mc Ghee (1979) it is sometimes used to indicate the presence of total organic matter. The higher values of COD were observed in March and lowest in July. DO and diversity of phytoplankton and zooplankton wee recorded in the month of August when all dissolved solid, Organic and inorganic material more diluted due to increase of water level. Gautam (1990) expressed similar views. High values of BOD and the plankton population are clearly indicative of the eutropic nature of the study lakes (Arora, 1966; Islam and Nahar, 1967; Gautam, 990).

An increase in BOD shows the in efficient xygen available to aquatic and this may be due to ore degradation of organic matter because of higher nperature .Water is generally CO2 free during day ie due to accelerated photosynthesis. The high ncentration of free CO2 due to less photosynthetic activity of the present phytoplankton population and more respiratory activity of zooplankton and other aquatic fauna. The higher concentration of chloride in the lake water is an index of pollution origin and there is a direct relation between chloride concentration and pollution level. Low concentration of chloride ion in the lake water, particularly in the monsoon indicates there is low amount of organic waste of animal origin during the rainy season. Low oxygen and crowding is cause of viral diseases Furunculosis and bacterial gill diseases. A direct relationship between Branchiomycosis and organic pollution of water is well known in fish culture practice.

Site 3 is a place where washer man uses detergents. Detergents are organic compounds, which have both polar and non polar characteristics. By several ways these detergents are translocate in water bodies. The degradation of alkyl phenol polyethoxylates (nonionic) can lead to the formation of alkyl phenol, which acts as endocrine disruptors. Detergents can have poisonous effects in all types of aquatic life if they are present in sufficient quantities and this includes biodegradable detergents (Sinha, 2007; Shahi, 2010). The doses up to 5 ppm and 15 ppm of these detergents kill fish eggs and fishes, respectively. Surfactants detergents are also decreasing the breeding ability of aquatic organisms. Phosphates in detergents can lead to freshwater algal blooms that release that release toxins and deplete oxygen in waterways. When the algae decomposes, they use up the oxygen available for aquatic life. However, untreated or primary treated effluents containing detergents may pose a problem. Chronic and/ or other sub lethal effects that were not examined in this study may also pose a problem.

Due to human influences habitat loss, fish diversity became less indicating alarming situation of Maheshara Lake. The ecological scenario of the lake is very asserting, once connected with Rapti River, was totally disrupted, annual average water level of lake down up to 1 meter. The lake is heavily fed by sewage water and garbage of Gorakhpur city, which contributes the main source of pollution. The municipality of Gorakhpur city has still not provided

Table 2: Different groups of Phytoplanktons during Nov. 2006 – Oct. 2007.

Class	Group	Genera	Species	% of species
Cyanophyceae	*Anabaena*	1	1	5.88 %
	Microcys	1	2	11.76 %
	Cylindrospermum	1	2	11.76 %
	Aphnocapsa	1	1	5.88 %
Chlorophyceae	*Spirogyra*	1	1	5.88 %
	Hydrodictyon	1	1	5.88 %
	Oedogonium	1	1	5.88 %
	Chlosterinum	1	1	5.88 %
	Padiastrum	1	1	5.88 %
	Cosmerium	1	1	5.88 %
	Scendesmus	1	1	5.88 %
Bacillariophyceae	*Fragilaria*	1	1	5.88 %
	Nitschia	1	1	5.88 %
	Navicola	1	1	5.88 %
	Synendra	1	1	5.88 %
Total	15	15	17	99.96 %

Table 3: Different groups of zooplanktons during Nov. 2006 – Oct. 2007.

Phylum	Group	Genera	Species	% of Species
Protozoa	*Rhizopoda*	2	2	8.69%
	Mastigophora	1	2	8.69%
	Ciliata	2	2	8.69%
Rotifera	*Rotifera*	5	9	39.0%
Arthropoda	*Copepoda*	3	3	13.0%
	Cladocera	5	5	21.7%
Total	6	18	23	99.87%

any sewage treatment system before its disposal into lake and there is an urgent call of the day to treat the sewage before its disposal into the Maheshara Lake. The enormous fishery potential of this lake apparent by the fact that it provides livelihood to hundred active fishermen besides giving direct/indirect job to thousand families. For sustainable exploitation of the fishery resources, it is imperative to develop suitable techniques for fishing, resource management and conservation programme to protect this valuable Maheshara Lake. However, the first and foremost requirement is the assessment of the resources. Which is not sustainable exploitation of the fishery resources, it is imperative to develop suitable techniques for fishing, resources management and conservation programme to protect this valuable Therefore the fish farmers can utilize this trend to optimize the growth performance of the cultured fish by taking these variations into account.

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EFFECTS OF CULTURING CONDITIONS ON THE MYCELIUM GROWTH OF *HYPSIZYGUS ULMERIS*

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ABSTRACT

In this study the effects of culture media, temperature and nutrients on mycelial growth were evaluated. The sporocarp was utilized as a source of tissue culturing. Initial culturing was done on malt extract agar plates. The discs (0.5 cm in diameter) from actively growing culture plates were planted on fresh media plates. Three replicates were taken in each case. An increase in diameter of the culture discs was recorded daily. It was observed that for the growth of this mushroom PDA is the most suitable medium, while MEA also supports its growth. The optimum temperature of the growth of this mushroom is 29 °C. Mineral nutrients are also one important factor for growth.

Key words: Culture Hypsizygous ulneris, Mycelium Growth.

Fungi inhibit every possible environment by utilizing the organic materials from plants and animals and even other for their nutrition and energy sources. Unlike the chlorophyll containing plants, which converts solar into chemical energy, fungi like animals, are totally dependent on the available organic material for all their nourishment, unlike the animals, most of the fungi are stationary and cannot pursue their food (Kendrick, 1985; Alexopolus and Mims, 1996). The fungi responsible for producing grand fruiting bodies are called as mushrooms. By extension, the term "mushroom" can also designate the entire fungus when in culture or the thallus (called a mycelium) of species forming the fruiting bodies called mushrooms, or the species itself. Mushrooms are saprophytic, growing on dead organic matter of vegetative origin. They can utilize almost all agricultural wastes as substrates (Miles and Chang, 1997). Cultivation of the oyster mushroom, *Pleurotus* spp., has increased greatly throughout the world during the last few decades (Chang, 1999; Royse, 2002) in 1997 it was accounted for 14.2 % of the total world edible mushroom production (Chang, 1999). Its popularity has been increasing due to its ease of cultivation, high yield potential and high nutritional value (Banik and Nandi, 2004). Oyster mushrooms are a good source of dietary fiber and other valuable nutrients. They also contain a number of biologically active compounds with therapeutic activities. Oyster mushroom modulates the immune system, inhibit tumor growth and inflammation and have hypoglycaemic and antithrombotic activities. It also lowers blood lipid concentrations, prevents high blood pressure and atherosclerosis, and has antimicrobial and other activities (Gunde-Cinermen, 1999).

Hypsizygus ulmarius, sometimes called the "elm oyster," is edible, but not so palatable as the other species of *Pleurotus* group. *Hypsizygus ulmarius* certainly must hold the record for being the most often misnamed mushroom. While it was formerly known as *Pleurotus ulmarius*, the most common error has been to use the name *Hypsizygus tessulatus*. Mayers (2004) however, indicates that *Hypsizygus tessellatus* is a smaller mushroom which usually grows in clusters, and is widely cultivated in Japan. And at present due to its peculiar features it is known as *Hypsizygus ulmarius*.

MATERIALS AND METHODS

Organism: Experiments were conducted with one of the edible mushroom *Hypsizygous ulmeris*. It was obtained from the culture collection of mushroom species, from New Delhi.

Preparation of the starter culture: The spore culture technique is used for this purpose. In this technique a sterilized filter paper is taken and was put into a sterilized petriplates aseptically. The pileus of the mushroom was placed aseptically on the filter paper. The plate was immediately covered with the lid. These plates were kept for the 24 hrs. The spore print obtained on the filter paper was used to prepare mushroom culture on the medium plates. The spores were transferred from the spore print to the PDA plates aseptically. The petriplates were incubated at 25 °C for 2-3 weeks until the spore started to grow.

Effect of culture media: Effect of different synthetic media on the colony growth of *Hypsizygus ulmeris* was evaluated. Agar media *viz* potato dextrose agar (PDA), malt extract agar media (MEA), wheat extract agar (WEA) and oat meal agar (OMA) were poured in 90 mm diameter petri plates. Five mm diameter agar plugs were removed with a sterile cork borer from the edges of colonies and one such plug was placed in the center of each 90 mm petri plate containing media. Plates were then wrapped with parafilm and incubated at 20°C in the dark. There were three replicate plates of each medium. The colony diameter in each plate was measured at 24h interval along two axes perpendicular to one another. The measurements for each day were observed and daily radial growth rates were calculated.

Effect of temperature: Effect of temperature on mycelial growth was evaluated on PDA. Inoculated plates were placed in plastic bags and incubated at 5, 27, 29, 30 and 37°C in the dark. There were three replicates of each treatment. At each temperature the colony diameters were measured as described above.

Effect of nutrients on different temperature: Effect of nutrients was observed by preparing buffers by adding $FeSO_4$, K_2HPO_4, $MgSO_4$ and KNO_3. The disc was inoculated on the petriplates containing PDA. 0.1 ml buffer was poured in each petriplate. Inoculated plates were placed in plastic bags and incubated at 5, 27, 29, 30 and 37°C in the dark. There were five replicates of each treatment. At each temperature colony diameters were measured as described above.

RESULTS AND DISCUSSION

In this study various parameters are taken to find out their effect in *in vitro* conditions. The effect of culture media, effect of temperature and the effect of nutrients in various combinations are the main factors for the analysis

In case of effect of culture media the radial mycelial growth rates of *Hypsizygous ulmeris* were significantly affected by culture media. In general, PDA and MEA were most favorable for fast radial growth of mycelium of all replicates tested. At 29°C, colonies on these two media reached the edge of the plates after 6 days of inoculation. The fungus formed circular, colorless and compact colonies with few or no aerial hyphae. On PDA the fungus initially formed a circular colony with hyaline hyphae. On WEA and OMA the mycelial growth was poor with scanty and thin mycelium (Table-1). Similarly Qureshi & Meah (1991) observed fastest liner growth of *B. theobromae* on Richard's agar, mango leaf extract agar and on PDA. They recorded highest number of pycnidia on mango leaf extract followed by PDA. Alasoadura (1969) observed maximum stromata of *B. theobromae* on malt agar and oatmeal agar. The size and number of pycnidia varied greatly within the substrate and biggest produced in nutrient rich medium (Sabalpara *et al.*, 1991).

In terms of effect of temperature the mycelial growth of *Hypsizygous ulmeris* showed a variable trend in response to changes in temperature on PDA medium. There was very little or no growth at low temperatures 37°C., However mycelial growth increased as temperature increased up to 29°C. Optimum growth occurred at 27-30°C. At 5°C mycelial growth was not observed after 6 days of incubation, but the fungus resumed growth when the plates were moved to 30°C. The pycnidia formation also showed same trends as mycelium growth with respect to temperature change. Highest number of pycnidia was recorded at 27-29°C followed by 30°C. After 37°C an increment in temperature also reduced the pycnidial formation on the culture media (Table-2). Our results are in close agreement of those reported by Quroshi and Meah (1991) and Alam *et al.*, (2001)

Table 1. Effect of different medium on the mycelium growth of *Hypsizygous ulmeris*

Days	Potato dextrose agar media (PDA)	Malt extract agar media (MEA)	Wheat extract agar media (WEA)	Oat meal agar media(OMA)
I	1.5	1.9	1.0	1.2
II	2.0	2.0	1.1	1.3
III	2.6	2.5	1.2	1.4
IV	3.4	3.2	1.5	1.6
V	3.7	4.0	1.5	1.6
VI	5.6	4.8	1.6	1.6

Table 2. Effect of different temperature on the mycelium growth of *Hypsizygous ulmeris* in Potato dextrose agar media (PDA) and Malt extract agar media (MEA).

Days	Potato dextrose agar media (PDA)					Malt extract agar media (MEA)				
	Temperature					Temperature				
	37°C	30°C	29°C	27°C	5°C	37°C	30°C	29°C	27°C	5°C
I	-	0.9	1.4	1.1	-	-	0.5	0.8	-	-
II	-	1.1	2.9	2.3	-	-	0.9	0.9	0.7	-
III	0.4	2.3	6.0	5.5	-	0.2	2.1	2.2	2.1	-
IV	0.6	5.5	7.4	5.6	-	0.3	2.2	2.5	2.5	-
V	0.8	6.0	7.5	6.0	-	0.4	2.8	3.2	3.2	-
VI	1.0	6.8	7.8	6.8	-	0.6	3.5	4.0	4.4	-

Table3. Effect of K_2HPO_4, $FeSO_4$ and KNO_3 along with different combinations of nutrients on the mycelium growth of *Hypsizygous ulmeris* at 29°C in Potato dextrose agar media (PDA).

Nuteients/ Days	I	II	III	IV	V	VI
K_2HPO_4	1.5	2.4	3.1	3.8	4.2	4.5
K_2HPO_4+$FeSO_4$	1.0	1.4	1.5	1.6	1.7	2.4
K_2HPO_4+ KNO_3	0.5	1.0	1.4	1.8	2.3	2.5
K_2HPO_4+$MgSO_4$	1.0	1.4	1.7	2.2	2.4	2.9
K_2HPO_4+$FeSO_4$+KNO_3+ $MgSO_4$	1.3	1.7	2.0	2.4	2.9	3.1
$FeSO_4$	0.8	1.5	1.8	2.0	2.5	2.6
$FeSO_4$ +K_2HPO_4	0.9	1.5	1.7	2.1	2.4	2.7
$FeSO_4$ + KNO_3	1.0	1.7	1.9	2.1	2.4	2.8
$FeSO_4$ + $MgSO_4$	0.9	1.3	1.5	1.7	2.1	2.3
$FeSO_4$+K_2HPO_4+ KNO_3+$MgSO_4$	1.0	1.4	1.7	2.1	2.5	3.1
KNO_3	1.2	1.9	2.0	2.0	2.8	3.0
KNO_3+K_2HPO_4	1.0	1.8	2.1	2.3	2.8	3.4
KNO_3+ $FeSO_4$	1.3	1.9	2.4	2.7	3.2	2.8
KNO_3+$MgSO_4$	1.3	1.7	1.8	2.0	2.6	3.5
KNO_3+K_2HPO_4+$FeSO_4$+$MgSO_4$	1.0	1.3	1.6	2.1	2.2	2.9

who reported 29°C and 25-30°C temperatures optimum for the colony growth and sporulation of *L. theobromae*.

The effects of different nutrients in various combinations are also reported. There is significant variability present in the results of nutrients, but the best result has been reported in case of $FeSO_4$. The effect of different minerals on mycelial growth of *Hypsizygous ulmeris* is given in Table. 4. Among the various minerals used, K_2HPO_4 and $FeSO_4$ exhibited significant growth of colony diameter. This result showed that mineral nutrients are also one important factor for growth. In contrast, growth was decreased by $MgSO_4$ and $FeSO_4$. Mycelial density was found higher in case of K_2HPO_4, whereas mycelial growth was lower in KNO_3, with increase in density of the mycelial colony (Table-3). Potassium ion plays important roles in the regulation of the growth of hyphal apices and the formation of branches. The results indicated that various factors and nutrients could be utilized to improve the growth of mycelium of *Hypsizygous ulmeris*.

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TO STUDY THE EFFECT OF VARIOUS LEVELS OF LEAD (PB) ON RUMEN FERMENTATION AND PROTECTIVE EFFECT OF ZINC ON LEAD TOXICITY *IN VITRO*

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ABSTRACT

The present study was carried out in an *in vitro* experiment was conducted to find out the effect of different levels of lead (Pb) (0, 25, 50,100,150 and 200 ppm) on rumen fermentation pattern, IVDMD and IVNDFD. Results showed that increasing levels of lead had an adverse effect on TVFA, TCA-ppt N, IVDMD and IVNDFD ($P<0.05$). To select the best level of zinc which will mitigate the adverse effect of lead, another *in vitro* experiment was carried out in which different levels of zinc (50,100,150,200,250 and 300 ppm) were added to 50 ppm of lead which acted as control. The supplementation of Zn at 50 ppm level showed a protective effect against adverse effect of lead.

Key words: Lead, Zink, invitro.

Lead is a toxic metal and gets accumulated in body tissues. Anemia, anorexia, weakness and loose feces are the important clinical symptoms in chronic lead poisoning in cattle (Radostits *et al.*, 2000). Recent research examining the etiology of lead toxicity induced hypertension reveals that the free radical production and lowering of inherent antioxidant reserves are directly related to vasoconstriction underlying lead induced hypertension. The mechanisms of lead-related pathologies, many of which are a direct result of the oxidant effect of lead on tissues and cellular components, may be mitigated by improving the cellular availability of antioxidants. N-acetylcysteine (NAC), zinc, vitamins B_6, C and E, selenium, taurine, and alpha-lipoic acid have been shown, to interrupt or minimize the damaging effects of lead. For the present studies zinc was selected to study its protective effect in lead exposed animals as it interferes with the absorption of lead. Zinc and lead compete for similar binding sites on the metallothionein like transport protein in the gastrointestinal tract. The competition between zinc and lead might decrease the absorption of lead, thus reducing lead toxicity

MATERIALS AND METHOD

Three rumen fistulated male Karan Fries animals of about 2½ years of age were used as the donor of rumen liquor. The nutrient requirements of the animals were met by feeding concentrate mixture and wheat straw (40:60) as per NRC (1981). The concentrate mixture consisted of GNC 21 parts, Maize 33 parts, wheat bran 20 parts, rice bran 11 parts, de-oiled mustard cake 12 parts, mineral mixture 2 parts and common salt I part. The animals were kept in ventilated individual byres during preliminary feeding period (21 days) and subsequent collection of rumen liquor. The byres were cleaned regularly and animals were washed every morning before feeding. Clean and wholesome water was offered ad lib twice a day. After 3 hours of feeding, rumen liquor samples were collected from donor animals from various sites of the rumen to ensure a homogenous sample. About 300 ml of rumen liquor was taken with the help of plastic tube (2 cm diameter) from each animal in a thermos flask and mixed immediately. It was strained

through two layers of muslin cloth and brought immediately to the laboratory for further analysis. All the precautions were taken to ensure maintenance of anaerobic conditions by flushing CO_2. Substrate: Concentrate mixture and wheat straw were ground separately by laboratory grinder and mixed in the ratio of 40:60. McDougall's Buffer- Artificial saliva was prepared by mixing the following chemicals in 1 liter of distilled water:

Sodium hydrogen carbonates ($NaHCO_3$):	9.80 g
Disodium hydrogen phosphate (Na_2HPO_4) :	.00 g
Potassium chloride(KCl) :	0.57 g
Sodium chloride :	0.47g
Magnesium sulphate ($MgSO_4.7H_2O$):	0.12 g
Calcium chloride (anhydrous) :	0.04 g

After dissolving the above chemicals in one liter of water, pH of the buffer was adjusted to 6.8 by passing CO_2.

The different levels of lead viz. 0, 25, 50, 100, 150 and 200 ppm

were prepared using lead acetate.

Each level of lead viz 0,25,50,100,150 and 200 ppm was incubated with 40 ml McDougall's buffer, 10 ml strained rumen liquor (SRL) and 0.5 g of the substrate in a conical flask fitted with rubber bung and having bunsen valve. All flasks were placed in a water bath maintained at a constant temperature of 39 ± 1°C for 48 hrs. The flasks were shaken at regular intervals. At the end of the incubation, the microbial activity of flasks was stopped with 2-3 drops of 1.07N H_2SO_4. The whole contents of the flask were centrifuged at 3000 rpm for 15 minutes and residue was transferred into pre-weighed silica crucibles and dried for overnight in a hot air oven maintained at 70-80°C. The supernatant was preserved in freezer for the estimation of TVFA, TCA perceptible N and ammonia nitrogen. Next day, the silica crucibles along with residues were weighed and from that DM disappearance percentage was calculated and further estimation of IVNDFD was carried out. Three *in vitro* experiments with three replicates were conducted. Therefore, each value presented in the results is an average of nine observations.

Total volatile fatty acids (TVFA)

TVFA concentration was estimated by the method of Barnett and Reid. One ml SRL was taken in Markham's apparatus and 1 ml of oxalate buffer (equal quantity of 5% Oxalic acid and 10% Potassium oxalate solution) was added to it. About 80 ml distillate was collected in a conical flask and titrated against 0.01 N NaOH using phenolphthalein as an indicator which gave light pink colour as an end point. TVFA concentration was calculated as:

$$\text{TVFA (meq/ 100 ml SRL)} = \frac{\text{Vol. of NaOH used x Normality of NaOH}}{\text{Vol. of SRL used}} \times 100$$

Ammonia nitrogen

Micro-diffusion technique of Conway was followed to estimate NH_3-N concentration in SRL. One ml of SRL was taken in outer chamber of Conway micro-diffusion cell and one ml of 2 per cent boric acid with mixed indicator was placed in the central chamber. One ml of saturated sodium carbonate solution was placed in the outer chamber just opposite to sample. The lid of the Conway dish was fixed and contents in the outer chamber were mixed thoroughly by rotating the assembly gently. The dish was incubated in the incubator at 39 ± 1°C for 2 hrs. After that the contents of the central chamber were titrated against 0.01N H_2SO_4 using a micro burette with fine tip. The ammonia nitrogen was calculated as:

$$\text{NH}_3\text{-N (mg/100 ml SRL)} = \frac{\text{Vol. of acid used x Strength of acid x 0.014 x } 10^3}{\text{Vol. of SRL used}}$$

Total- N

Two ml strained rumen liquor was digested with 3 ml of concentrated H_2SO_4 and a pinch of digestion mixture (Potassium sulphate and Copper sulphate mixed in the ratio of 9:1). After digestion, the contents were cooled and transferred to micro-kjeldahl unit for distillation. Approximately, 60 ml of distillate was collected in a conical flask containing 10 ml of 2 per cent boric acid with mixed indicator (0.1% methyl red and 0.1% bromocresol green mixed in the ratio of 2:1). The whole contents were titrated against 0.01N H_2SO_4. The total nitrogen was calculated as follows:

$$\text{Total N (mg/ 100 ml)} = \frac{\text{Vol. of acid used x Strength of acid x 0.014 x } 10^3}{\text{Vol. of SRL used}}$$

TCA precipitable N

Five ml rumen liquor was taken in a centrifuge tube and 5 ml of 30 per cent Trichloroacetic acid (TCA) was added to it. The mixture was mixed well. After keeping the contents overnight, the tubes were centrifuged at 3000 rpm for 10 minutes. Two ml of supernatant was taken in a micro-kjeldahl flask and digested with 3 ml of concentrated H_2SO_4. The whole contents were transferred to micro-Kjeldhal assembly. About 60 ml distillate was collected in a conical flask containing 10 ml of 2 per cent boric acid with mixed indicator and titrated against 0.01 NH_2SO_4. The total amount of Non-protein nitrogen (NPN) in 100 ml SRL was calculated. The TCA precipitable Nitrogen was calculated by subtracting the NPN from total nitrogen.

***In Vitro* Dry Matter Digestibility (IVDMD)**

IVDMD was estimated as per the method of Goering and Van Soest. The weight of disappearance of DM was observed and percentage of DM disappearance was calculated.

***In Vitro* Neutral Detergent fiber Digestibility (IVNDFD)**

Samples of each treated substrate and its respective residual DM were analyzed. For that residue sample was taken in 1000 ml spoutless beaker and to it 100 ml of neutral detergent solution was added and refluxed for 1 hr. After refluxing, samples were filtered through pre weighted sintered glass crucibles (G-1) using vacuum pump. The washings were given to residue with hot water to ensure the complete removal of detergent and final washing was given with acetone. The residue in sintered glass crucibles was dried in oven at 80 °C for overnight and then weighed again to find out the amount of neutral detergent fibre left.

RESULTS AND DISCUSION

The various levels of lead selected for *in vitro* studies were 0, 25, 50,100,150 and 200 ppm using lead acetate. Each level of lead was tested in triplicate and three trials were conducted. Results indicated that IVDMD (%) was 47.49 in control whereas at 200 ppm, it decreased significantly to 36.23 ($P<0.05$). Similarly IVNDFD in control was 38.15% and at 200 ppm level of lead, it decreased to 27.33% showing a significant and adverse effect of lead (Pd"0.05). Similar trend was observed with TVFA concentration and TCA-ppt N concentration. With increasing levels of lead at 50 ppm onwards, the rumen fermentation, IVDMD and IVNDFD were adversely affected under in vitro conditions. To select the best level of zinc, which will mitigate the harmful effect of lead and for feeding to goat kids, another in vitro experiment was planned. The institute ethic committee permitted us to feed 50 ppm of lead to cross–bred kids.

Therefore, in this experiment, 50 ppm of lead was taken as control and to this, various levels of zinc were added (0, 50,100,150,200,250 and 300 ppm). Results showed that IVDMD in control group (50

Effect of different levels of lead on rumen fermentation *in vitro*

Level of lead	IVDMD (%)	IVNDFD (%)	TVFA (meq/100ml SRL)	Ammonia N (mg/100ml SRL)	TCA ppt N (mg/100ml SRL)
0 (ppm)	47.49^{a}±0.33	38.15^{a}±0.35	4.50^{a}±0.18	8.72^{a}±.072	13.06^{b}±0.2
25 (ppm)	45.97^{c}±0.09	36.06^{c}±0.21	3.59^{b}±0.13	6.62^{a}±0.14	13.22^{b}±0.14
50 (ppm)	39.68^{b}±0.48	31.00^{b}±0.31	3.42^{b}±0.13	6.57^{b}±.10	12.20^{b}±0.19
100 (ppm)	39.90^{b}±0.49	30.79^{b}±0.29	3.17^{b}±0.11	9.32^{c}±0.16	12.13^{b}±0.37
150 (ppm)	40.32^{b}±0.39	30.84^{b}±0.35	2.57^{c}±0.11	9.13^{c}±0.16	11.83^{ab}±0.30
200 (ppm)	36.23^{a}±0.30	27.33^{a}±0.34	2.74^{c}±0.03	5.52^{c}±0.25	9.90^{a}±0.17

❖ Value bearing different superscripts in a column (a, b, c) differ significantly ($P<0.05$)

ppm lead) was 45.07% and with 50 ppm of zinc supplementation, it increased significantly to 47.20% ($P<0.05$), Level of zinc more than 50 ppm did not show encouraging results on IVDMD. IVNDFD digestibility also exhibited the similar trend and at 50 ppm level of zinc the digestibility was significantly ($Pd"0.05$) higher (37.65%) as compared to control (36.09%). The concentration of TVFA and TCA ppt nitrogen also increased significantly at 50 ppm of zinc supplementation. Mentioned parameters were

Protective effect of zinc on adverse effect of lead on rumen fermentation *in vitro*

Level of Lead+zinc	IVDMD (%)	IVNDFD (%)	TVFA (meq/100ml SRL)	Ammonia N (mg/100ml SRL)	TCA ppt N (mg/100ml SRL)
0 (ppm)	$45.07^{bcc}\pm0.37$	$36.09^{c}\pm0.34$	$4.43^{cd}\pm0.08$	$9.08^{c}\pm0.08$	$13.61^{c}\pm0.39$
50 (ppm)	$47.20^{a}\pm0.17$	$37.65^{a}\pm0.23$	$5.02^{a}\pm0.11$	$10.05^{a}\pm0.08$	$14.11^{ac}\pm0.18$
100 (ppm)	$45.65^{c}\pm0.33$	$35.36^{d}\pm0.20$	$4.30^{fecg}\pm.058$	$9.05^{dc}\pm0.16$	$12.53^{fc}\pm0.33$
150 (ppm)	$44.94^{bcc}\pm0.43$	$34.27^{f}\pm0.16$	$4.18^{gd}\pm.09$	$8.78^{bcc}\pm0.10$	$13.08^{eac}\pm0.43$
200 (ppm)	$45.16^{dc}\pm0.20$	$32.10^{g}\pm0.21$	$3.95^{ed}\pm0.06$	$8.55^{bfe}\pm0.16$	$11.93^{bef}\pm0.38$
250 (ppm)	$44.88^{bc}\pm0.33$	$30.34^{e}\pm0.23$	$3.87^{d}\pm0.05$	$8.10^{b}\pm0.18$	$12.11^{dce}\pm0.31$
300 (ppm)	$43.54^{b}\pm0.22$	$27.07^{b}\pm0.25$	$3.28^{b}\pm0.17$	$7.88^{b}\pm0.16$	$11.46^{bfg}\pm0.33$

❖ Value bearing different superscripts in a column (a, b, c, d, e, f, g) differ significantly ($P<0.05$)

recorded maximum at 50 ppm level of zinc supplementation. It indicated that addition of zinc had a protective effect against adverse effect of lead.

CONCLUSION

Lead addition @ 50 ppm and above had an adverse effect on rumen fermentation, IVDMD and IVNDFD digestibility *in vitro*. Supplementation of 50 ppm zinc had a protective effect against 50 ppm lead and enhanced TVFA, TCA-ppt N, IVDMD and IVNDFD *in vitro*.

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EFFECT OF FIVE INSECTICIDES AND NEEM PRODUCTS ON CITRUS PSYLLA, *DIAPHORINA CITRI* ON CITRUS.

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ABSTRACT

A Study was conducted to evaluation of five insecticides *Viz* – Acephate 75 SP, triazohpos 40EC, Cypermethrin 25EC, imidacloprid 70 WS and phosalone35 EC and neem products *Viz*-NSKE 5% and neem oil 2%. Study revealed that triazophos (0.075%) was most effective in managing the population of citrus psylla followed by Acephate (0.03%), phosalone (0.03%), imidalopride (0.004%) and Cypermethrin (0.03%) but among neem products NSKE 5% was more effective than neem oil (2%).

Key Words: Citrus psylla, *Diaphorina citri*, neem oil.

Citrus is one of the important fruit crops in India. Productivity and quality of citrus is severely affected by several factors; insect pest being one of them, citrus psylla, *Diaphorina citri* is one of the major insect pests causing large scale damage regularly to citrus cultivars. Both the nymphs and adults suck the vital plant sap from the young shoots. Citrus psylla is a vector of citrus greening disease, which accelerates citrus decline syndrome (Bove 2006). It is active during spring and dry spells during monsoon (Shivankar *et al* 2001). High humidity associated with dry spells and moderate temperature 25-30°C is congenial for its rapid development.

MATERIALS AND METHODS

A trial was conducted during 2010-2011; there were 8 treatments and 4 replications, and one 8 years old plant was taken for each replication, which selected for observation and treatment of citrus psylla. The population of *D. citri* was observed on 15 cm long terminal shoots, from each direction (North, West, South and East). Population of citrus psylla observed one day before treatment and 1st, 3rd, 5th, and 7th day after spray. The required amount of solution for each treatment was prepared by dissolving measured/ weight quantity of one insecticide and sprayed as well as nymph's population of citrus psylla reach on ETL (10-15 nymphs/ terminal shoot). Spray of insecticides done after 4: PM to get the effective result of NSKE and neem oil. The percent population reduction of *D. citri* over control was computed, pooled and subject Arch line transformation.

PREPARATION OF NSKE

Fresh and ripe seeds of *Azadiracta indica* were collected and dried in shade and 100 litres water was taken, 200gm detergent and 5kg fresh neem seed kernels (well dried), removed from neem seed and grind the kernels gently with the help of power grinder at 4000rpm for 30 min, after that, soak it overnight in

10 liter of water, and stir with wooden plank in the morning till solution becomes milky white. After this process, filter it through double layer of muslin cloth and make the volume to 100 liter and add 1% detergent (make a pest of the detergent and then mix it in the spray solution), mix the spray solution well and use.

RESULT AND DISCUSSION

All the treatments were effective and significantly superior over control at all interval of observation except NSKE 5% and neem oil 2% at 1 and 3 days after spraying (Table.1), triazophos (0.075%) gave highest mortality 99.5% 3 DAT, 99.5% 5 DAT, 99.5% 7 DAT all effectiveness intervals, P.K. Arora et al. (2005) found similar result of triazophos against citrus psylla. The order of insecticidal effectiveness (per cent population reduction) against citrus psyllla was as follows- triazophos (0.07%), 88.6(PPR) > Cypermethrin (0.03%), 88.0 (PPR) > imidacloprid (0.004%), 87.8 (PPR) > Acephate (0.03%), 85.5 (PPR) > phosalone (0.03%), 58.4 (PPR) > NSKE (5%), 68.3 (PPR) > neem oil (2%), 40.2 (PPR) one day after treatment, Pramod Kumar et al. (2005) recorded similar efficacy of NSKE against *Diaphorina citri*. And 3 day after treatment effectiveness of treatment in order as follows- triazophos (0.07%), 99.7(PPR) > Cypermethrin (0.03%), 90.1 (PPR) > imidacloprid (0.004%), 89.4 (PPR) > acephate (0.03%), 90.8 (PPR) > phosalone (0.03%), 90.1 (PPR) > NSKE (5%), 68.3 (PPR) > neem oil (2%), 69.0 (PPR). S. Neelima et. al. (2011) studded of neem oil against *Amrasca devastans*. Percent population reduction was recorded 5 DAT in order as follows-

Tab:1- Percent population reduction over control day after treatment, of Citrus psylla, Diophorina citri.

Treatments	Population 1 DBT/6" Shoot	Percent population reduction over control - Day after treatments			
		1 DAT	3 DAT	5 DAT	7 DAT
Acephate 75 SP	39.7	85.50	90.60	95.10	95.00
Trizophos 40 EC	40.6	88.60	99.50	99.50	99.50
Cypermethrin 25EC	40.9	88.00	90.00	90.20	90.00
Imidacloprid	39.9	87.80	89.20	89.40	89.70
Phosalone 35 EC	38.0	58.40	90.00	90.40	90.50
NSKE (5%)	41.0	68.30	69.10	70.00	75.10
Neem Oil (2%)	40.2	68.00	69.00	69.00	75.00
Untreated control	40.0	0.20	0.20	0.20	0.20
SE(m)		10.532	11.308	11.444	11.377

triazophos (0.07%), 99.5 (PPR) > Cypermethrin (0.03%), 90.2 (PPR) > imidacloprid (0.004%), 89.4 (PPR) > acephate (0.03%), 95.1 (PPR) > phosalone (0.03%), 90.4 (PPR) > NSKE (5%), 70.0 (PPR) > neem oil (2%), 69.0 (PPR). Jaydeep Halder et. al. (2011), reported highest mortality of imidacloprid against aphids on vegetable crops. 7 DAT recorded percent population reduction as follows- triazophos (0.07%), 99.5 (PPR) > Cypermethrin (0.03%), 90.0 (PPR) > imidacloprid (0.004%), 89.7 (PPR) > acephate (0.03%), 95.0 (PPR) > phosalone (0.03%), 90.5 (PPR) > NSKE (5%), 75.1 (PPR) > neem oil (2%), 75.0 (PPR).

CONCLUSION

Highest percent population reduction was recorded of Phosalone 35 EC all over the control follows the other treatment, and there is no significantly difference among the treatments, 1DAT, 3DAT, 5DAT & 7DAT.

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EFFECT OF ZINC SUPPLEMENTATION ON ANTIOXIDANT PROFILE OF LEAD FED GROWING KIDS

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ABSTRACT

Nineteen crossbred goat kids (Alpine x Beetle) were divided into three groups. The kids were fed concentrate mixture and green lucerne to meet their nutrient requirements. In T_1 group, kids were given 50 ppm of lead and T_2 animals were supplemented with 50 ppm lead+50 ppm of zinc daily for 90 days and without any supplement in control group (C). Lead, haemoglobin and blood enzyme profile was analyzed in blood samples taken at monthly intervals. At 90 days, the blood lead concentration level in control, T_1 and T_2 group differed significantly (Pe"0.05). A significant (P<0.05) increase in alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activity with decrease in haemoglobin concentration in blood with lead exposure was observed showing an adverse effect of lead. A decrease in the activity of superoxide dismutase and catalase was observed in lead supplemented group indicating that the animals were under oxidative stress (Pe"0.05). Supplementation of zinc showed a protective effect in kids by decreasing AST and ALT activities to values observed in control group. The adverse effect of lead on lipid peroxidation was measured by TBARS activity which showed an increasing trend with lead supplementation. Thus, Zn can be helpful in mitigating the adverse effect of lead.

Key Words: Lead, Zinc supplementation, antioxidant profile, kids

Livestock is exposed to a wide range of toxicants from various sources (Radostits et al., 2005). Among the toxicants heavy metal like lead, arsenic, cadmium, mercury etc. are widespread and detrimental to animal health. In India lead toxicosis of livestock has been reported from five states viz., Punjab, Delhi, Rajasthan, Andhra Pradesh, and Maharashtra (Dogra et al, 1996).Lead either alters the liver functions directly by binding with thiol group of liver enzyme and some carrier proteins (Jones, 1954) or metabolized to more toxic product and free radicals, which alters the mitochondrial activity and genetic information. In any biological system where ROS production increases, antioxidant reserves are depleted. If the production of free radicals or reactive from of oxygen is faster than can be neutralized by the antioxidant mechanism of cell, oxidative stress will occur (Sies, 1991). Two specific sulfhydryl-containing enzymes, delta-aminolevulinic acid dehydratase (ALAD) and glutathione reductase (GR) are inhibited by lead intake which was found depressed in both animal and human lead-exposure studies. The mechanisms of lead-related pathologies, many of which are a direct result of the oxidant effect of lead on tissues and cellular components, may be mitigated by improving the cellular availability of antioxidants. N-acetylcysteine (NAC), zinc, vitamins B6, C and E, selenium, taurine, and alpha-lipoic acid have been shown, to interrupt or minimize the damaging effects of lead. Zinc has a protective effect in lead exposed animals as it interferes with the absorption of lead as zinc and lead compete for similar binding sites on the metallothionein like transport protein in the

gastrointestinal tract, thus reducing lead toxicity. The information regarding the supplementation of zinc to lead exposed animals to counteract the adverse effect is scanty. Thus, the present study was carried out to observe the protective effect of zinc on the adverse effect of lead by studying the dry matter intake (DMI), nutrient utilization parameters, and growth rate and blood antioxidant enzymatic profile in growing crossbred kids.

MATERIALS AND METHODS

Nineteen Alpine Beetle crossbred male goat kids were selected from the institute herd. The animals were randomly divided into three groups (control-C, T_1 with 50 ppm lead as lead acetate supplementation and T_2 with 50 ppm zinc in addition to 50 ppm lead) with initial body weight (kg) of 8.92, 9.14 and 8.93 kg. The nutrient requirement of the animals was met by feeding concentrate mixture (CP 20% and TDN 70%) and lucerne as per NRC (1981). The concentrate mixture comprised of GNC 21 parts, Maize 33 parts, wheat bran 20 parts, rice bran 11 parts, de-oiled mustard cake 12 parts, mineral mixture 2 parts and common salt 1 part. Calculated amount of lead and zinc were weighed and put into a gelatin capsule. This capsule was given to the animal orally to ensure that the animal has consumed the required quantity. The ration schedule was changed weekly after recording the body weight of the animal to meet the nutrient requirement. The clean drinking water was offered three times a day i.e. at 8:00 am, 12:00 noon and 6:00 pm. About 5-6 ml of blood was collected from the jugular vein of each kid with 20 gauge disposable needle, on zero day and then at monthly nterval in a heparinized (@ 25 IU/ml of blood) test ube. Heparin was reconstituted in 0.9 % NaCl ormal saline) solution. To separate the plasma, the lood samples were centrifuged at 3000 rpm for 15 inutes. The plasma samples were stored in the frigerator for the estimation of Aspartate nsaminase (AST), Alanine transaminase (ALT) and d peroxidase (TBARS) activity. The haemoglobin estimated in whole blood. The activity of enzymes superoxide dismutase (SOD) and catalase was estimated in hemolysate fraction. Blood samples were wet digested with tri-acid mixture. The tri-acid mixture was prepared by mixing conc. HNO_3, conc.H_2SO_4 and 70% perchloric acid in the ratio of 5:2:2, respectively. Ten ml blood sample was taken in a 100 ml kjeldahl flask to which equal amount of tri-acid mixture was added. This mixture was digested until it became transparent (carbon free). The contents were made to 10 ml with distilled water. The samples were further diluted so that the final sample does not contain about 5% acid. Lead was estimated by AAS (Hitachi Model, Z-5000 with Zeeman) using acetylene as fuel and air is oxidant. Specific (lead) hollow cathode lamp was used for the determination of lead AAS data book (1990). The haemoglobin (Hb) content of blood was estimated by Drabkin (1944) cyanmethaemoglobin method. The samples for the analysis of antioxidant enzymes were prepared as described by Aebi (1984). The haemolysate was then used to carry out further analysis of SOD and catalase enzymes. The activity of SOD enzyme was assayed. Catalase enzyme activity was estimated spectrophotometrically Aebi, (1984). The extent of lipid peroxidation, an index of oxidative stress was measured as thiobarbituric acid reactive substances (TBARS). Lipid hydro peroxides were measured by TBA test. For the estimation of AST and ALT, 2, 4 - DNPH method of Reitman and Frankel (1957) was used. All the data was subjected to the statistical analysis as per the analysis of variance technique (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

The blood lead concentration in control, T_1 and T_2 group was 0.20±0.01, 0.25±0.01 and 0.24±0.01 ppm, respectively. At 90 days, the blood lead concentration level in control, T_1 and T_2 group differed significantly and was 0.19±0.03, 0.27±0.01 and 0.25±0.02 ppm in three groups respectively (Pe"0.05). The haemoglobin level decreased significantly In group T_1 (lead supplemented), (Pd"0.05) after 30 days and at 90 days, there was a further decrease in haemoglobin percentage indicating

Table 1. Effect of lead and lead + zinc supplementation on blood lead concentration in goat kids

Days	Control	T_1	T_2
0	0.20±0.02	0.21±0.02	0.21±0.02
30	0.22±0.02	0.25±0.02	0.24± 0.02
60	0.20± 0.02	0.26±.02	0.25±0.02
90	0.19^{a}±0.02	0.27^{b}±0.02	0.25^{ab}±0.02
Mean±SE	0.20±0.011	0.25±.009	0.24±.009

❖ Value bearing different superscripts in a row (a, b) differ significantly (P<0.05)

Table 2. Effect of zinc supplementation on haemoglobin (gm %) in lead fed goat kids

Days	Control	T_1	T_2
0	9.93 ± 0.10	10.04^{a}± 0.11	9.79 ±0.36
30	9.83 ± 0.21	9.95^{ab} ± 0.17	9.88±0.35
60	9.73 ±0 .22	9.84^{ab}± 0.24	9.31±0.48
90	9.67 ± 0.13	8.96^{b}± 0.41	9.00 ±0.25
Mean ± SE	9.82 ± 0.05	9.70 ± 0.22	9.48± 0.20

❖ Value bearing different superscripts in a column (a, b) differ significantly (P<0.05)

Table 3. Effect of zinc supplementation on AST activity (units/ ml of plasma) in lead fed goat kids

Days	Control	T_1	T_2
0	27.77± 3.29	28.53^{b} ± 1.84	28.10 ± 2.93
30	26.35 ± 2.33	28.69^{b} ± 1.45	26.59 ± 1.79
60	27.77 ± 1.07	31.08^{b} ± 1.32	29.46 ± 1.32
90	29.17 ± 1.11	41.08^{a} ± 3.23	36.21 ± 1.46
Mean ± SE	27.76^{b} ± 0.58	32.34^{a} ± 2.97	30.09^{ab} ± 2.13

❖ Value bearing different superscripts in a row and column(a, b) differ significantly (P<0.05)

Table 4. Effect of zinc supplementation on ALT activity (units / ml of plasma) in lead fed goat kids

Days	Control	T_1	T_2
0	21.48 ± 0.78	22.14^{b} ± 0.52	21.17 ± 1.69
30	22.70 ± 2.92	23.70^{ab} ± 0.63	20.59 ± 0.90
60	21.34 ± 2.92	27.48^{ab} ± 0.63	22.20 ± 0.90
90	20.67 ± 0.83	30.23^{a} ± 1.17	24.43 ± 1.50
Mean ± SE	21.55^{b} ± 0.42	25.89^{a} ± 1.83	22.10 ^{b}± 0.85

❖ Value bearing different superscripts in a row and column(a, b) differ significantly (P<0.05)

Table 5. Effect of zinc supplementation on superoxide dismutase activity (units /g Hb) in lead fed goat kids

Days	Control	T_1	T_2
0	1861.21 ± 92.07	1861.20 ± 82.06	1864.88 ± 60.37
30	1889.68 ± 83.30	1862.56 ± 72.80	1862.23 ± 54.77
60	1901.07 ± 54.60	1715.90 ± 91.74	1880.19 ± 81.77
90	1891.91 ± 54.65	1705.54 ± 78.32	1850.14 ± 81.19
Mean ± SE	1885.95 ± 8.60	1786.50 ± 43.80	1803.85 ± 34.55

Table 6. Effect of zinc supplementation on catalase activity (µmoles of H_2O_2 consumed/minute/g Hb) in lead fed goat kids.

Days	Control	T_1	T_2
0	132.76 ± 5.91	132.84 ± 5.10	133.82 ± 1.66
30	133.10 ± 2.45	129.50 ± 6.70	129.03 ± 1.37
60	132.42 ± 3.18	129.91 ± 1.92	131.07 ± 5.36
90	133.97 ± 1.76	129.58 ± 2.57	123.75 ± 1.88
Mean ± SE	133.06 ± 0.34	128.93 ± 1.94	129.42 ± 2.13

Table 7. Effect of zinc supplementation on TBARS activity (nmol/ml of plasma) in lead fed goat kids

Days	Control	T_1	T_2
0	1.31 ± 0.19	1.32 ± 0.20	1.29 ± 0.21
30	1.35 ± 0.14	1.34 ± 0.14	1.37 ± 0.09
60	1.35 ± 0.14	1.64 ± 0.41	1.57 ± 0.22
90	1.34 ± 0.15	1.75 ± 0.13	1.65 ± 0.11
Mean ± SE	1.33 ± 0.01	1.51 ± 0.04	1.47 ± 0.03

the adverse effect of lead on hemoglobin. However, zinc supplementation could not exhibit its protective effect in restoring the hemoglobin values equal to control. The reason might be due to short duration of the study. The AST activity in lead supplemented group (T_1) increased significantly (Pd"0.05) from 28.53 (day 0) to 41.08 units/ml of plasma at day 90 whereas the activity in control group during the experimental period was 27.76 units. Overall, on an average, the AST activity in 3 respective groups was 27.76±0.58, 32.34±2.97 and 30.09±2.13 exhibiting a significant increase and adverse effect with exposure of lead to the kids (P<0.05). Zinc supplementation was helpful in mitigating the adverse effect against lead but might be due to the short duration of the experimental period, the zinc supplementation could not express its protective effect to a full extent. On an average, the ALT activity, in control, T_1 and T_2 groups was 21.55±0.42 25.80±1.83 and 22.10±0.85 units/ml plasma, showing a significant effect of dietary treatments (P<0.05). Looking at overall average of 90 days experimental period, it was inferred that supplementation of zinc showed a protective effect against lead supplementation resulting in decreased value of ALT activity equal to control values. On an average, the SOD activity (units/g Hb) in control, T_1 and T_2 groups was 1885.95±8.60, 1786.50±43.80 and 1803.85±34.55 respectively (Pe"0.05).The SOD activity increased in lead supplemented group (T_1), which indicated that the animals were in oxidative stress but zinc supplementation in group T_2 could not restore the values equal to control, (Pe"0.05). Similar observations were observed with catalase activity. On an average, the catalase activity (µ moles of H_2O_2 consumed/minute/g Hb) in control, T_1 and T_2 group was 133.06±0.34, 128.93±1.94 and 129.42.82±2.13 (Pe"0.05). With exposure to lead in group T_1, there was a decrease in the catalase activity as compared to control group. In group T_2 where zinc was supplemented, it exhibited its protective effect but probably due to short duration of the experimental period, the results were insignificant statistically (Pe"0.05). The TBARS activity (nmol/ml of plasma) estimated at monthly intervals in control, T_1 and T_2 groups was 1.33±0.01, 1.51±0.04 and 1.47±0.03, respectively (Pe"0.05). In control group, at day 0, the activity was 1.31±0.19 but in lead exposed animals (T_1) the activity increased to 1.64±0.41 and 1.75±0.13 at day 60 and 90 (Pe"0.05). In zinc supplemented group (T_2), though overall, there was a decrease in activity of TBARS, but the value could not come at par with control group. The reason for this might be the short duration of the study. Similar observation made by Bhatia and Chaudhary (1996), Dey *et. al.* (1996), Forbes and Reina (1972), Reitman and Frankel (1957).

CONCLUSION

The levels of lead in blood increased significantly at 90 days after dietary supplementation of 50 ppm lead in goat kid's ration. Zinc supplementation @ 50 ppm showed a protective effect against lead on liver enzymes like ALT and AST. Oxidative enzymes (SOD and catalase) and TBARS were not adversely affected by dietary supplementation of lead@50 ppm, during a period of 90 days. Zinc has a protective effect against adverse effect of lead but studies need to be confirmed by conducting the experiment for a longer duration.

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PHYSICO CHEMICAL STUDY OF GROUND & MUNICIPAL WATER OF OUTER REGION OF ALLAHABAD DISTRICT, U.P., INDIA

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ABSTRACT

This paper show the physico chemical study of ground & municipal water of outer region of Allahabad district. Three different ground water samples from Shiv Kuti (S.K.), Teliar Ganj (T.G.),Transport Nagar (T. N.) and one municipal water sample from Beni Ganj (B.G.) railway crossing during Jan 2011-June 2011 were collected and analysed. The values obtained were compared with standards prescribed by WHO & ISO 10500-91. In the present study three water samples were within the limit. One water sample showed high T.D.S., T.H., Cl, T.A. and low D.O. values indicating poor water quality, The significance of the results is further discussed.

Key words: Turbidity, physicochemical parameters, ground water pollution, electrical conductivity.

Water is well known universal solvents and it is extremely essential for the survival of all living being. Industrial waste, agricultural waste, domestic waste and the municipal solid waste is one of leading causes of pollution of surface & ground water. Contamination of water resources available for household & drinking purposes with heavy elements, metal ions and harmful microorganism is one of the serious health problem (APHA, 1989).The rapid growth of urban areas has further affected. The ground water quality due to over exploitation of resources and improper waste disposal practices (Baligar and Chavadi,2004 ;Manivaskam, 2005).Considering above aspects of ground water contamination the present study was under taken to investigate and compare the quality of ground water and municipal water with WHO criteria .

MATERIALS AND METHODS

Shiv Kuti (S.K.), Teliar Ganj (T.G.), Transport Nagar (T. N.) and Beni Ganj (B.G.) railway crossing region are in Allahabad district & situated south of main city. These are outer region of Allahabad City. The people are using ground water as well as municipal water for daily need. The present investigation was carried out by selecting four different sites from Allahabad city.

Water samples were collected from four sampling points of different locality of Allahabad city during periods of six months Jan 2011-June 2011. The sampling points and places were given in Table-1.

Water samples were collected in plastic canes of 3 liter capacity as per standard procedure, The physicochemical parameters Electrical Conductivity (E.C.), Total Dissolved Solids (T.D.S.), Turbidity, Dissolve Oxygen (D.O.), Total Alkalinity (T.A.), Total Hardness (T.H.), Calcium (Ca^{++}), Magnesium (Mg^{++}), Sodium (Na^{+}), Potassium (k^{+}), Chloride (ClÉ), Sulphate (SO_4ÉÉ), Nitrate (NO_3É) were determined using standard methods by Patil et. al., (2001), Purandara et. al., (2003) and Shriniwasa and Venkateshwara,(2000). Reagents used for the present investigation were A.R.Grade and distilled water was used for preparing various solutions.

RESULTS AND DISCUSSION

The average values of physicochemical parameters during Jan 2011-June 2011 are presented in Table-2. The pH is a measure of the intensity of

Table 1:Sampling points & places

S. No.		
1.	Shiv Kuti (S.K.)	Ground water
2.	Teliar Ganj (T.B.)	Ground water
3.	Transport Nagar (T. N.)	Ground water
4.	Beni Ganj (B.G.)	Municipal water

acidity or alkalinity and gives the concentration of hydrogen ions in water. It has no direct adverse effect on health, but a low value below 4.0 gives sour taste & higher value above 8.5 shows alkaline taste by Singh,(2006). In the present study the pH values of water samples vary between 6.0 to 7.7 and were within limit prescribed by WHO.

Electrical conductivity (E.C.) value signifies the amount of total dissolved salts. An EC value varies from 500 to 2531 µmho/cm which reveals that EC values for all samples were in the prescribed limit. The EC value for sample D (500) was found minimum. The sample A has highest EC values. Total dissolved solids (T.D.S.) indicate the general nature of water quality or salinity. Water containing more than 500 mg/l of TDS is not considered desirable for drinking water supplies, but in unavoidable cases 1500 mg/l is also allowed (Reddy,1981). In the Present investigation, TDS values varied from 153 to 1090 mg/l. It shows that sample A have higher value than the prescribed limit given by ISI 10500-9. The highest TDS value in sample A may due to sewage pond near the sampling points. Sample C&D have lover values than the prescribed limit ISO 10500-91.

Turbidity of water is actually the expression of an optical property (Tyndall effect) in which the light is scattered by the particles present in water. Turbidity make the water unfit for domestic purposes, food & beverages industries and many other industrial uses. In the present study the turbidity values varies between 4.1 to 8.0 NTV and were within the limit prescribed by ISO 10500-91.

Dissolved oxygen (DO) is one of the important pollution parameters in water quality assessment and reflects the physical and biological processes prevailing in the water. The DO values indicate the degree of pollution in water bodies. In present investigation, DO value varies between 3.0 to 8.1. The results indicate that the DO is not depleted except sample A which showed low DO value indicating heavy contamination by organic matter.

The alkalinity of water is measure of its capacity to neutralize acids. The alkalinity in water is caused by carbonates, bicarbonates and hydroxide. Total alkalinity value for A, B, C samples was found to be greater than the values prescribed by W.H.O.

Hardness of water mainly depends upon the amount of calcium (Ca^{++}) or magnesium (Mg^{++}) salts or both. Hardness of water is objectionable regarding water use for laundry & domestic purpose, since it consume a large quantity of shop. In the present study total hardness value varies from 161 to 934 mg/l. The values for A, B & C samples were higher than the prescribed limit.

The amount of calcium (Ca^{++}) varies from 24.00 to 118.5 mg/l. and the magnesium (Mg^{++}) content is regarding between 23.35 to 168.4 mg/l. which is found within the prescribed limit except sample D below prescribed limit and sample A above prescribed limit. Sodium (Na^{+}) concentration varies between 10 to 68 mg/l and found below prescribed limit. Potassium (k^{+}) concentration varies from 0.7 to 3.7 mg/l in which no standard values are suggested for drinking by WHO & ISO 10500-91.

Chloride (ClÉ) imparts salty taste if present in excess (>250 mg/l). People in take to high chloride in water are subjected to laxative effect (Trivedi and Goel, 1986). Chloride presence in study area ranges

Table-2 Average Value of Physico chemical parameters with drinking water standard (Jan 2011 to June 2011)

Sl No.	Parameters	Sampling Points				WHO 1993		ISO 10500-91	
		A	B	C	D	Min.	Max		
1	pH	6.0	6.5	7.0	7.7	6.7	7.7	6.5	8.5
2	EC	2531	1480	1450	500	466	2914	1400	-
3	T.D.S.	1090	500	400	153	160	1080	1000	500
4	Turbidity	6.9	8.0	4.1	4.7	3.8	8.6	-	-
5	DO	3.0	5.9	7.1	8.1	2.7	8.2	-	-
6	TA	620	427	410	180	140	614	120	200
7	TH	934	575	505	161	168	923	500	300
8	Ca^{++}	118.5	99.40	80.25	24.00	25.65	117.8	100	75
9	Mg^{++}	168.4	98.20	74.90	25.30	25.34	153.2	150	30
10	Na^{+}	65	53	68	10	15	73	200	200
11	K^{-}	0.70	0.78	2.80	3.70	0.6	3.4	-	-
12	Cl^{-}	381	400	330	74.38	69.02	477.5	250	250
13	SO_4^{-}	93.01	58.80	61.35	40.51	39.73	93.39	250	200
14	NO_3^{-}	0.147	0.081	0.051	0.041	0.035	0.158	45	45

(All Parameters are mg/l except pH, EC and Turbidity. EC in µmhos /cm, Turbidity in NTU)

from 74.38 to 400.0 mg/l. Only the sample 'D' was found within prescribed limit. The sulphate (SO_4ÉÉ) content varies between 39.83 to 93.40 mg/l and the nitrate content varies between 0.041 to 0.147 mg/l. The sulphate (SO_4ÉÉ) & nitrate (NO_3É) values were found within the prescribed limit.

Deviation is shown by hand pump water from municipal drinking water with the standard (WHO) indicating that ground water is polluted. The causes of pollution appear to be sewage & industrial effluents. The quality of water in the sample A is inferior compared to other water samples probably due to sewage pond is very close to hand pump. The water sample (A) is highly polluted and unfit for drinking purpose. Similar results were obtained by Dahiya and Kaur (1999) and Manivaskam(2005).

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HOUSING SYSTEMS OF DAIRY CATTLE AND BUFFALOES IN TRANS-YAMUNA RURAL AREA OF ALLAHABAD

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ABSTRACT

Housing is one of the key aspects of Livestock Management which must provide conditions for high productivity, good health, comfort for the animals, convenience of management, besides being economical. The present study was conducted among 200 livestock owners, representing ten villages of five development blocks in Trans-Yamuna rural area of Allahabad. The study revealed that majority (45%) of them housed their animal in katcha houses, 46 percent respondents kept their cattle and buffaloes in the same shed and 16.5 percent shared the same shed along with their animals. Thatched roof was most common in animal house (48%) and three-fourth (80.50%) of the respondents had single slope roof. Katcha floor was most common in the study area and provision of drainage channels were lacking in majority (85.0%) of houses.

Key words: Housing, animal house, Katcha, Allahabad.

Livestock plays an important role in the national economy and in the socio-economic development of the country Acharya (1990). Livestock rearing forms an integral part of the Indian farming systems in integration with crop production and production of milk, meat and draught power apart from other products and services. Arora (2001). The raising of dairy cattle and buffaloes is an effective instrument to bring about social changes and to improve the rural economy, as it supplements the family income and helps in generating gainful employment among the landless labourers, small and marginal farmers and women's Sandhu (1987) & Anonymous (2006). Dairy animal housing helps in moderating the range of micro-environment to which the animals are exposed and maximize their production by protecting them from extreme weather conditions. Proper housing provides adequate aeration, sunlight, protection against adverse weather conditions, the systems of housing also help to determine the feeding and management of the livestock to a large extent. Prasad (1992), Prasad (2000) & Anonymous (2003).

MATERIALS AND METHOD

Five blocks *viz*., Chaka, Jasra, Karchhana, Kaundhiara and Shankergarh of Allahabad district of Uttar Pradesh were chosen for the present investigation. Two villages from each block and twenty household from each village comprising of five categories i.e. landless, marginal farmers (2.5 acre), small farmers (5.0 acre), medium farmers (upto 15.0 acre) and large farmers (>15.0 acre) were selected randomly and thus 200 respondents were selected for collection of needed information. Multistage stratified random sampling technique was adopted for selection of sample household. The information collected through personal interview technique through schedules and questionnaire developed for the purpose were analyzed statistically. Schedecar and Cochran (1967).

Table 1. System, type and mode of housing for cattle and buffaloes in different categories

Particulars	Landless Farmer n=40	Marginal Farmer n=44	Small Farmer n=40	Medium Farmer n=40	Large Farmer n=36	Total n=200
a. System of housing						
Loose	–	–	–	–	–	–
Conventional/ confined	40 (100.00)	44 (100.00)	40 (100.00)	40 (100.00)	36 (100.00)	200 (100.00)
b. Type of housing						
Pucca	4 (10.00)	7 (15.91)	14 (35.00)	18 (45.00)	20 (55.56)	63 (31.50)
Thatched	26 (65.00)	11 (25.00)	8 (20.00)	2 (15.00)	–	47 (23.50)
c. Mode of housing						
i. In open (IO)	–	–	–	–	–	–
ii. Under tree (UT)	–	–	–	–	–	–
iii Under shelter (US)	–	–	–	–	–	–
iv Indoor (close house + let loose in day. (ILL)	–	–	4 (10.00)	3 (7.50)	–	7 (3.50)
v. 1 + 2 + 4	10 (25.00)	11 (25.00)	8 (20.00)	6 (15.00)	4 (11.11)	39 (19.50)
vi. 5 + 3	6 (15.00)	8 (18.18)	10 (25.00)	8 (20.00)	10 (27.77)	42 (21.00)
vii. 2 + 4	8 (20.00)	7 (15.91)	4 (10.00))	5 (12.50)	2 (5.56)	26 (13.00)
viii. 1 + 3 + 4	16 (40.00)	18 (40.91)	14 (35.00)	18 (45.00)	20 (55.56)	86 (43.00)

RESULTS AND DISCUSSION

The data regarding housing pattern of dairy cattle and buffaloes under five categories of respondent surveyed during the study period are presented in Table 1.

It is evident from the table that all the respondents kept their animals in the confined/ conventional housing. Majority (45%) of them housed their animals in katcha houses, followed by pucca (31.5%) and thatched houses (23.5%). Dhiman (1988) reported 63.75, 27.50 and 8.75 percent farmers, Panwar (1992) reported 87.63, 5.67 and 6.70 percent respondents had pucca, katcha and thatched houses, respectively in adopted villages of Hissar and Karnal respectively. Pandey *et al.* (2004) reported that all the three category of farmers in the study area of Kanpur Dehat district had katcha houses. Rathore and Kanchwaha (2009) observed that 41.0, 35.50 and 23.50 percent respondents had katcha, pucca and semi-pucca buffalo shed, respectively in study area of Jhunjhunu which is in consonance to the present findings.

Regarding place of housing 43 percent respondents preferred housing their animals indoor in combination of IO + US + ILL. It was observed that there was a common belief that animal should be kept indoor at least during winter nights. The findings pf

Verma (1989) and Panwar (1992) are in consonance with the present findings. The data indicates that maximum respondents of the study area kept their animals in combination of two or three places. 25.0 percent of farmers kept their animals separate from dwelling plus in field or open.

Perusal of the data indicates that majority (77.0%) of the respondents provided manger in open and 23.0 percent of them under shed. As most of the feeding was done in the open, provision of manger was less in shed and more in open. The findings are contrary to Panwar (1992). Most of the respondents provided adequate manger length/diameter per adult unit (more than 56 cm) under shed as well as in open. The findings are in agreement with the reports of Verma (1989) and Panwar (1992).

Provision of fresh and clean drinking water is an important aspect of proper management. Majority (56.5%) of the respondents preferred to take their animals to water source, whereas 22.0 percent used buckets/tasla and about 17.5 percent practised a combination of both as per the feasibility, findings are in consonance with Panwar (1992). It was observed that 67.5, 75.0 and 78.0 percent respondents offered water two to three times daily during summer, winter and rainy season respectively, the findings of the present study are in consonance to the findings of Verma (1989) and Panwar (1992).

Majority (46%) of the respondents kept their cattle and buffaloes in the same shed and 16.50 percent shared the same shed along with their animals, which showed their high affinity for their livestock. Similar findings were reported by Verma (1989) and Panwar (1992).

Regarding the roof structure of animal houses, majority (48%) of the respondents and around 75.0 percent landless, 56.81 percent marginal and 50.0 percent small farmers had thatched roof. More than three-fourth (80.50%) of the respondents had single sloped roof while only 9.50 percent had flat roof in their animal houses. Findings are contrary to findings of Verma (1989) and Panwar (1992). It may be respondents had katcha floor and only 3.0 percent of them had bricks lined with cement. None of the respondents among landless, marginal and small farmers had floor of bricks lined with cement, findings of earlier investigators are in line with present finding. Similarly more than three-fourth of animal houses (85.0%) had no provision of drainage channels in the study area, whereas only 15.0 percent of respondents had drainage channel.

The findings of the present study revealed that existing housing management system were not very satisfactory. Majority of the animal houses in study area had improper shed lack of manger in shed lacuna is type of floor, slope of floor, roof, lack of water trough and followed conventional housing system.

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EFFECT OF ORGANIC MANURE ON THE UPTAKE OF CADMIUM BY FENUGREEK

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ABSTRACT

A pot experiment was conducted to study the effect of organic manure on the uptake of cadmium in fenugreek. The soil used was collected from Sheila Dhar Institute of soil science (Texture: Silty clay loam, Clay :36.4%,CEC:20.7 Cmol (p^+) kg-1,Organic C:0.50% and DTPA-Cd 0.34 mg kg^{-1}). Initial Ph of the soil was 7.6 which increased to 7.8 after irrigation. Plastic pots (each containing 5 kg of soil) were used. Fenugreek was grown as test crop. Organic manure was applied as Vermicompost to provide at the rate of 0,5,10 and 15 mg t ha^{-1}. Cadmium was applied as $CdCO_3$ at the rate of 0,5,10 and 15 mg kg^{-1} soil with three replication of each treatment. A lesser adsorption from plots treated with Cd × Vermicompost clearly indicates that there is a competition between Cd and Vericompost as the adsorption of Cd is reduced in presence of Vermicompost.

Kew words: Cadmium, Vermicompost, interaction, fenugreek

Intake of vegetable is an important path of heavy metals toxicity to human being. Bioavailability of Cd, Cu,Zn and Mn in the human gastrointestinal tract from the edible part of vegetable using in vitro gastrointestinal (GI) extraction technique was assessed by Intawongse and Dean (2006).

Severe exposure of Cd may result in pulmonary effect such as Emphysema, Bronchiolitis and Alveolitis. Renal effect may also result due to sub chronic inhalation of Cd (European Union 2002; Young, 2005).

The use of sewage-sludge has received much attention due to enrichment of heavy metals in soil. Among the toxic heavy metals, cadmium (Cd) is great environmental concern because of its higher bioavailability in soil (Mench et al.,1994) and toxicity to humans and livestock by readily getting into the food chain (Gupta and Gupta, 1998). The cadmium may enter the soil-plant system through sewage-sludge (Jones et al., 1993).

Bioaccumulation of toxic heavy metals by crop plants has been recorded by a number of workers and is matter of serious concern. (Singh and Agarwal, 2005; Wahid et al., 2007).

The Ph-induced Cd immobilization in soil is attributed to various reasons such as increase in adsorption due to increase in surface negative charge, greater affinity of hydroxyl species (e.g. Cd OH^+) for adsorption sites than Cd^{2+} and precipitation of Cd as $Cd(OH)_2$ (Bolan and Duraisamy 2003).

In addition to the immobilization of heavy metals, covering soil with suitable plants has proven helpful in preventing the dispersion of the contaminant through erosion (Ruttens et al., 2006). Vermicompost with about 30% of humified organic matter is produced by a special type of composting that uses earthworm, which feed organic residues from farming activities and the microorganisms in the digestive system transform proteins, carbohydrate, fats, nucleic acids, etc. in humus of gray to black colors, with high capacities for exchange and for water adsorption. The molecular structure of Vermicompost contains carboxylic acids responsible for the adsorption of heavy metals in a process that involve exchange of protons of weak organic acids for Cd^{2+} ions dissolved in aqueous solutions.(Carrasquero and Flores,2004).

The present investigation was carried out in order to find out the ability of the Vermicompost for

reducing the uptake of cadmium by a fenugreek plant (Trignella foenum graecu L.) growing in a soil added with Cadmium.

MATERIALS AND METHODS

Vermicompost was selected for the study of interaction between Cd x Vermicompost. For this purpose a pot experiment was arranged. The soil used was alluvium collected from Sheila Dhar Institute of soil science (Texture:Silty clay loam, Clay:36.4%,CEC:20.7 Cmol (p$^+$) kg-1,Organic C:0.50% and DTPA-Cd 0.34 mg kg^{-1}), initial pH of the soil was 7.6 which increased to 7.8 after irrigation. Plastic pots (each containing 5 kg of soil) were used. Fenugreek was grown as test crop for the study of interaction between Cd x Vermicompost. Organic manure was applied as Vermicompost to provide at the rate of 0,5,10 and 15 mg t ha^{-1}. Cadmium was applied as $CdCO_3$ at the rate of 0,5,10 and 15 mg kg^{-1} soil with three replication of each treatment. Soil in each pot was mixed thoroughly to ensure intimate distribution of applied Cd and Vermicompost. All the pots received uniform basal application of 50 kg N, 50 kg P_2O_5 and 50 kg K_2O ha^{-1} as Urea, Single Super Phosphate and Murate of Potash respectively. After 24 hrs of the treatment seeds were sown. Soil moisture was maintained by irrigation the crops at intervals of 5-6 days. Fenugreek was harvested after 45 days. The plant material was thoroughly sun dried and the dry matter yield was determined. Plant sample were digested in tri-acid mixture (750 ml. conc. HNO_3, 150 ml conc. H_2so_4 and 300 ml $HClO_4$). Cd was determined by Atomic Adsorption Spectrophotometer Perkin Elemar make modle ANALYST-100 at Central Environment Pollution Control Lab, Indian Farmers Fertilizer Cooperative Ltd. (IFFCO), Phulpur.

Composition of Vermicompost

A commercial Vermicompost was obtained from the locality of Allahabad India. The chemical composition (on dry basis) was Water 50%, Organic matter 38%, Total nitrogen 0.8% Phosphorus, calcium and magnesium 1.2, 1.0 and 2.4% respectively. Vermicompost was air dried for three days and sieved 75 µm particle sizes.

RESULTS AND DISCUSSION

The data on the yield of fenugreek as influenced by different combination of Cd and Vermicompost (Table-1 &Fig.1) clearly that Cd alone decreased the yield of fenugreek but with Vermicompost the yield was affected variably. Vermicompost alone increased the yield of fenugreek but the percentage increased was less as compared o the control 15 t ha^{-1} of Vermicompost level along with all levels of Cd (5, 10 and 15 mgkg^{-1}) enhanced the yield of fenugreek as compared to Cd alone lower levels of Vermicompost (5 and 10 t ha^{-1}) in conjunction with different levels of Cd did not affect the yield very much.

It is obvious from these results that Vermicompost inhibits the effect of Cd on the yield especially when Vermicompost is added at high levels of 15 t ha^{-1}.

Concentration of Cd in Fenugreek Shoots: The Cd content in the shoot of fenugreek increased with increasing levels of added Cd. The increased concentration of Cd in plant tissue can be due to its increased availability in the soil. Cd content reduced in fenugreek shoot when Cd was applied along with Vermicompost (Table-3 & Fig 2). The maximum reduced Cd content in fenugreek shoot with application 15 t ha^{-1} Vermicompost level than at 10 t ha^{-1} levels. It is clear from these data that Vermicompost behaved antagonistically towards Cd uptake in shoot of fenugreek plant.

Roots: In all treatments, the uptake of Cd in the roots of fenugreek was high in comparison to the shoot of fenugreek (Table-3 & Fig-3). A salient feature of the results of root analysis is that the concentration of Cd in root was very much affected at 15 t ha^{1} level while at the similar concentration of Vermicompost in soil, uptake of Cd in shoot was higher than in roots. Where Cd and Vermicompost were applied jointly to the soil Cd concentration in roots was very much affected. Vermicompost lowered Cd accumulation in roots. Thus it may be concluded that Cd x Vermicompost interaction shows an antagonism with respect to Cd uptake in roots of fenugreek plant.

The results obtained from the interaction between Cd x Vermicompost in soil clearly indicate that the fenugreek grown in treated plots exhibit a lesser

Table 1: Physio-chemical properties of soil

pH	7.6
EC(dSm^{-1})at 25^{0}C	0.16
Organic carbon	0.58%
Total Nitrogen	0.05%
CEC [C mol (p$^+$) kg^{-1}]	20.7
Total Phosphate	0.04%
DTPA Cd	0.34 mg kg^{-1}

Table-2 Effect of applied Cd and Vermicompost on dry Biomass Yield of Fenugreek (g/pot)

Cd-Source	Cd-rate (mg kg^{-1})	Organic manure- source	Organic manure rate (t ha^{-1})	Yield g/pot
$CdCO_3$	0	Vermicompost	0	2.5
			5	3.0
			10	3.5
			15	3.8
$CdCO_3$	5	Vermicompost	0	2.4
			5	3.1
			10	3.4
			15	3.7
$CdCO_3$	10	Vermicompost	0	1.8
			5	1.4
			10	3.2
			15	3.5
$CdCO_3$	15	Vermicompost	0	1.4
			5	1.5
			10	1.6
			15	2.6

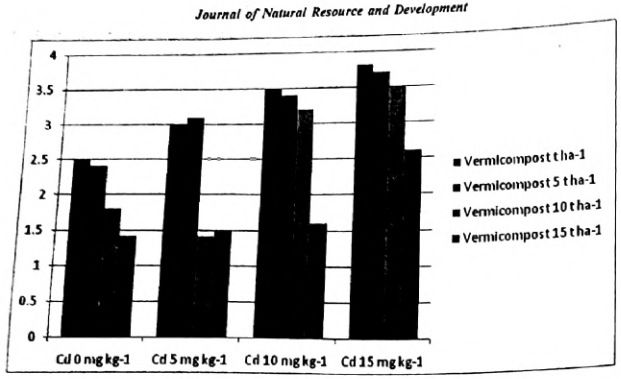

Fig-1. Effect of applied Cd and Vermicompost on dry biomass Yield of Fenugreek (g/pot)

Table-3: Effect of applied Cd and Vermicompost on Cd concentration (mg ha^{-1}) in Fenugreek shoots and roots.

Cd-Source	Cd-rate (mg kg^{-1})	Organic manure- Source	Vermicompost-rate (t ha^{-1})	Cd-concentration (mg kg^{-1})	
				Shoot	Root
$CdCO_3$	0	Vermicompost	0	0.50	0.80
			5	0.45	0.60
			10	0.40	0.50
			15	0.35	0.40
$CdCO_3$	5	Vermicompost	0	1.20	1.80
			5	2.24	2.50
			10	1.60	1.80
			15	0.50	1.95
$CdCO_3$	10	Vermicompost	0	4.0	5.40
			5	4.8	5.00
			10	2.6	4.40
			15	1.60	1.40
$CdCO_3$	15	Vermicompost	0	4.40	10.50
			5	3.80	9.80
			10	3.30	7.90
			15	3.00	7.00

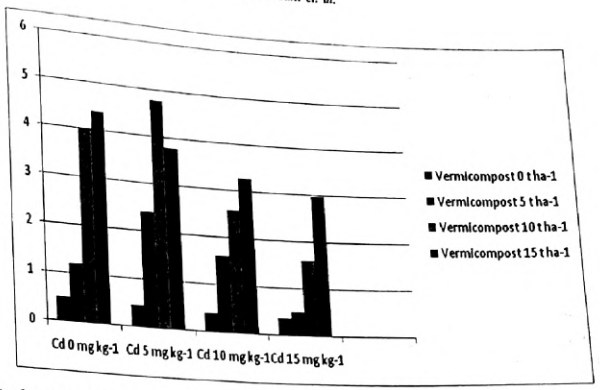

Fig-2. Effect of applied Cd and Vermicompost on Cd concentration (mg kg^{-1}) in Fenugreek shoot

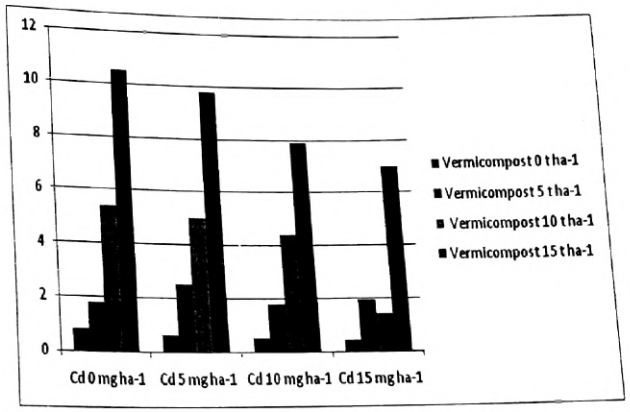

Fig.-3 Effect of applied Cd and Vermicompost on Cd concentration (mg kg^{-1}) in Fenugreek roots

concentration in shoots and root in comparison to the Cd treatment alone.

A lesser absorption from plots treated with Cd x Vericompost clearly indicates that there is a competition in between Vermicompost x Cd and as the absorption of Cd is reduced in each case in presence of Vermicompost. Such an antagonism can also be predicted from their ionic size and similar valiancy. A preferential accumulation of Cd in roots over shoot may be due to the intimate content of root

with the soil colloid where Cd is rather loosely. Addition of the amendment produced the decrease of Cd bioavailability as a consequence of the formation of complexs between the heavy metals and carboxylic groups of hulmic substances which are too large molecules to permeate root cells. The role of humic substance for reducing the uptake of heavy metals was studied by Narancikova and Markonikova (2003) who concluded that organic matter not only from strong complexes but also may retains heavy metals in exchangeable forms. For example copper ions which are bounded in an unavailable from while cadmium remains as an exchangeable ion, making the effects of the humified materials depended on the type of heavy metal and the results of this study seems to indicate that the tendency for lead is to be immobilized. Soil conditions as pH, cationic exchange capacity among others also influence the bioavailability of heavy metals in the presence of organic matter.

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BACTERIAL QUALITY OF RAW MILK AS INFLUENCED BY TIME INTERVAL BETWEEN MORNING AND AFTERNOON MILKING AT SHIATS DAIRY FARM

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ABSTRACT

The present study was undertaken on 12 healthy Jersey × Sindhi crosses of similar age group between 5 to 6 years of age. All milch cows were housed in tail to tail barn system under similar managemental conditions. Sanitary precautions were taken for producing milk with low bacterial count. Representative samples of milk were collected at 4 a.m. and 2 p.m. twice a week for two months aseptically directly from udder into sterilized conical flasks and brought to laboratory for determining standard plate count (SPC), lactic acid bacterial count (LABC), proteolytic bacterial count (PBC), lipolytic bacterial count (LBC) and coliform count (CC). Samples were analyzed statistically by using paired 'T' – test @ 5 per cent level of significance. Results showed that time interval between 4 a.m. and 2 p.m. milking had significant effect on LABC, PBC, LBC and CC which were significantly higher in milk of 2 p.m. milking than in milk of 4 a.m. milking, however density of SPC were not significantly different in milk drawn at 4 a.m. and 2 p.m. milkings.

Key words: Jersey × Sindhi crosses, Bacterial quality, Raw milk, Time interval.

Quality of raw milk includes microbial attributes which is of great importance to the dairy farmers and industry because of minimum legal standards (*Prasad, 2010*). The external factors which contribute to bacterial flora in raw milk are cow's skin, flank, udder, milker, utensils, barn, method of milking, feed and water, method of handling milk, etc. Production of quality milk with low bacterial count is required for longer keeping quality and to make good quality dairy products. The difference in composition of milk becomes significant when the variation between intervals of two milking is greater. Such interval between milkings might affect bacterial density of raw milk. With this in view the present experiment was undertaken to determine bacterial quality of raw milk as influenced by time interval between morning (4 a.m.) and afternoon (2 p.m.) milking at SHIATS Dairy Farm.

MATERIALS AND METHODS

Twelve healthy Jersey × Sindhi crossbred milking cows of 5 to 6 years group were selected from the herd of SHIATS dairy farm. All cows were housed in Tail to Tail barn under similar management condition. Sanitary precautions like clipping of long hairs on the udder and flanks, grooming, washing of hind quarters, wiping udder with towel soaked in 2% dettol solution, tying tail with leg etc. were taken care prior to collection of milk samples. Cows were milked by dry full hand method of milking at 4:00 a.m. in the morning and 2:00 in afternoon. Two streams of fore milk from each quarter of udder were discarded as per recommendation of *Singh and Prasad (1987)*, then representative sample of 250 ml milk was collected directly into sterilized conical flasks. Samples of milk were brought to laboratory for determination of microflora namely Standard Plate Count for total bacterial count and four physiological groups of bacteria namely Lactic Acid Bacterial Count, Proteolytic Bacterial Count, Lipolytic Bacterial Count and Coliform Count per ml milk as per methods

described by *Chalmers (1953)*. The data were analyzed using paired T-test as per *Snedecor and Cochran (1994)*.

RESULTS AND DISCUSSION

Mean values of different parameters are presented in Table 1

Mean Standard Plate Count in raw milk of morning and afternoon milking ranged from 405.33 and 311.08 per ml, respectively. The differences in SPC per ml of milk due to morning and afternoon milking intervals were found non-significant which are in agreement with the results reported by *Neeraj and Prasad (1991)*.

Lactic Acid Bacterial Count in raw milk of morning and afternoon milking ranged from 14.70 and 21.80 per ml, respectively. The differences in these due to morning and afternoon milking intervals of cows were significant. Mean LABC per ml obtained in raw milk are in agreement with reports of *Pandey and Neeraj (2003)*.

Proteolytic Bacterial Count in raw milk of morning and afternoon milking ranged from 22.08 and 39.58 per ml, respectively. The differences in these due to morning and afternoon milking intervals were significant. However, the average values of PBC per ml in raw milk are in line with the result of *Pandey and Prasad (2001)*. Results showed that afternoon milk registered significantly higher proteolytic bacterial count than morning milk.

Lipolytic Bacterial Count in raw milk of morning and afternoon milking ranged from 13.00 and 24.20 per ml, respectively. The differences in these due to morning and afternoon milking intervals were found significant. Milk of morning milking registered significantly less density of LBC than afternoon milk. Results are in agreement with *Pandey and Prasad (2001)*.

Coliforms per ml in raw milk of morning and afternoon milking ranged from 23.45 and 27.87 per ml, respectively. The differences in the coliforms per ml of milk due to interval of milking were significant. Presence of coliforms in raw milk and density of these bacteria obtained in this study is in agreement with results of *Pandey and Prasad (2001)*.

CONCLUSION

The results revealed that interval between morning and afternoon milking had a significant effect on lactic acid bacterial count, proteolytic bacterial count, lipolytic bacterial count and coliform, which were significantly higher in milk of afternoon milking of Jersey × Sindhi cows than milk of morning milking, however density of standard plate count (total viable count) were not significantly different due to interval of morning and afternoon milking.

Table 1. Mean bacterial count per ml of milk

Parameters	Mean bacterial count per ml		T-value
	Morning milk	Afternoon milk	
Standard Plate Count (10^4)	405.33	311.08	0.02474 *N.S.*
Lactic Acid Bacterial Count (10^3)	14.70	21.80	12.85 *S*
Proteolytic Bacterial Count (10^2)	22.08	39.58	2.54 *S*
Lipolytic Bacterial Count (10^2)	13.00	24.20	13.35 *S*
Coliforms	23.45	27.87	107.32 *S*

S = significant N.S. = Non significant Table value = 2.092

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"FOOD PREFERENCES AND OBSERVATION OF TIFFIN'S CARRIED OUT BY SCHOOL GOING CHILDREN (4-6 YEARS) IN TRANS YAMUNA AREA OF ALLAHABAD DISTRICT, U.P."

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ABSTRACT

Foods for preschooler easily manipulated and handled as preschoolers are generally clumsy. A number of studies have described on children's acceptance of a wider variety of foods as they are repeatedly exposed to them, even from very early in utero life or via breast milk after birth. To find out food preferences of school going children. and To observe Tiffin carried out for school lunch. The present study entitled "A study on food preferences and observation of Tiffin's carried out by school going children (4-6years) in Allahabad district" was conducted under the following heads: Selection of sample, Collection of data, Analysis of data. Survey method was adopted in order to collect the data from the selected respondent with the help of pre tested standardized interview schedule. The children were interviewed during the period of study for the collection of required information schedule include the aspects which led to the fulfillment of the objective. One third of children take fast food ever day. Data obtained from food preference of children showed that vegetarian children were higher in comparison to non vegetarian children.

Key words: food habits, junk food, children.

Environmental influences such as publicity), school-based nutrition education programmes or school meals also play a relevant role (Neumark-Sztainer et al, 1999; Skinner et al, 2002). A number of studies have described children's acceptance of a wider variety of foods as they are repeatedly exposed to them, even from very early in utero life or via breast milk after birth.

According to theoretical models, they can be arranged at different levels of influence: individual, social environmental, physical environmental and macrosystem influences. Preferences play an important role in defining children's food patterns, as they are linked to food acceptance. Foods should be such that can be easily manipulated and handled as preschoolers are generally clumsy. Handy finger foods like cutlets,hard boiled eggs, small sandwiches, rolls and whole fruits are easy to pick and eat especially at the school table, small pieces of food that can be easily handled with spoon or fork should be served. Vegetables are generally disliked and consumption of sweets may be excessive. This may also lead to obesity in small children. These, however, should not be treated as issues by parents and handled with care. Too much of attention at meal times only makes the child resort to unfair means of achieving their ends.

MATERIALS AND METHODS

The present study was conducted under the following heads:

1. Selection of sample
2. Collection of data
3. Analysis of data

1. Selection of sample

Selection of sample is important in data collection. Three stage sampling procedure was adopted for collection of data.

a. Selection of study area
b. Selection of school
c. Selection of respondent

a. Selection of study area: Trans Yammuna area of Allahabad district of U.P. India was selected purposively for the study. It has a good number of schools from where it was possible to collect the required data. Further, it was convenient to carry out by the research scholar.

b. Selection of school: A few visits were made to the schools, keeping in mind the objectives of the study. The school selected was-

" Ethel Higginbottom school

c. Selection of respondent: A 100 school going children (4-6years) were randomly selected for the study.

2.Collection of data

Survey method was adopted in order to collect the data from the selected respondent with the help of pre tested standardized interview schedule. The children were interviewed during the period of study for the collection of required information schedule include the aspects which led to the fulfillment of the objective.

Food habits and food preferences of school going children was recorded during the diet survey, observe the Tiffin's of school going children for four days in alternate days.

3. Analysis of data

Tables were prepared on the basis of data collected and statistical analysis done to interpret the data.

$P = n / N \times 100$

Where

P = percentage
n = number of respondent
N = total number of respondent

The present study pertaining belonging to "A Study on Food Preferences and Observation of Tiffins Carried Out By School Going Children (4 - 9 Years) in trans yamuna area of Allahabad District U.P." was conducted by survey method.

RESULTS AND DISCUSSION

The results obtained are discussed below:

Table 1 Food frequency among school going children in Percentage.

Food Groups	Children 4 – 6 years		
	Daily	Fortnight	Never
Cereal and Cereal Products	100	-	-
Pulses & Legumes	93	2	5
Leafy Vegetables	48	40	12
Roots & Tubers	100	-	-
Other Vegetables	50	47	3
Fruits	70	30	-
Meat & Fish	10	28	62
Egg	14	20	66
Milk & Milk Products	100	-	-

Table 1 shows that 100 percent school going children belonging to age group 4-6 years took cereals and cereal products, roots and tubers and milk and milk products daily. In 83 percent children were consume milk and milk products daily and 17 percent forthnightly. 40 percent children consume leafy vegetable at forthnight. 66 percent never took egg . 25-30 percent 4-6 years children are not taken meat and fish in forthnight.

Table 2 Cereals and cereal products Preferences among school going Children in Percentage.

Recipes	Children 4 – 6 years		
	Most Like	Like	Dislike
Chapatti	57	43	-
Puri	45	54	1
Paratha	78	22	-
Stuffed Paratha	92	8	-
Kachodi	18	80	2
Bread / Bun	100	-	-
Sandwich	70	30	-
Daliya	40	30	30
Halwa	100	-	-
Vermicilli	100	-	-
Poha	55	45	-
Rice	68	23	9
Maggi / Noodles	100	-	-

Table 2 shows that average cereals and cereal products preferences in 4-6 years among school going children. The maximum number of recipe wise preference among school going children consume magi, chowmin, vermicelli, halwa. 30 percent children are dislike daliya. 80 percent children are like kachodi.

Table 3: Milk & Milk Products Preferences among school going children in Percentage.

Recipes	Children 4 – 6 years		
	Most Like	Like	Dislike
Milk	75	20	5
Curd	28	40	32
Chesse	40	51	9
Lassie	63	24	13
Kheer	47	32	21

Table V shows that maximum 75 percent 4-6 years school going children were most like milk with bournvita and horliks, it is efficient supplement to the incomplete protein of cereals, fruits and vegetables. 28 percent children are most like curd. 63 percent 4-6 years school going children are most like lassi.

Table 4:Beverages Preferences among school going children in Percentage.

Recipes	Children 4 – 6 years		
	Most Like	Like	Dislike
Cold drinks	47	32	21
Soft drinks	57	41	2
Tea	18	29	53
Coffee	10	30	60
Lassie	63	24	13
Lemon water	28	40	30
Rashna	75	20	5
Fruit Juice	10	35	55
Frooti	63	24	13

Table 4 shows that maximum 75 percent 4-6 years school going children were most like rashna because it is sweet and as fruit taste. 50 to 60 percent children are dislike coffee. Caffine present in tea and coffee it stimulates gastric secrection. 55 percent 4-6 years school going children are dislike fruit juice.

Table 5: Commercial Snacks Preferences among school going children in Percentage.

Recipe	Children 4 – 6 years		
	Most Like	Like	Dislike
Chips	47	32	21
Biscuits	35	37	28
Kurkure	40	28	32
Chocholate	57	38	5
Fruit Cake	47	32	21
Cake / Pastry	63	24	13
Patties	-	-	100
Ice – cream	95	5	-
Maggi	100	-	-
Samosa	-	-	-
Cutlet	50	38	12
Dosa	18	29	53
Chowmin	63	24	13
Burger	57	28	15
Pizza	60	22	8

Table 5 shows that maximum 100 percent school going children in 4-6 years were mostly like maggi and ice -cream. This table shows that maximum school going children are most like commercial snacks. 37 percent children are liked biscuit. 40 percent children are most like kurkure. 100 percent 4-6 years school going children are dislike samosa.

CONCLUSION

On the basis of results it may be concluded that nearly one third of children take fast food every day. Data obtained from food preference of children it is observed that vegetarian children were higher in comparison to non vegetarian children. In non vegetarian children most of them consume egg in the form of omelet.

It was also concluded that although cereals was consumed by all these children because it is staple diet, liking for green vegetables was very less.

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EFFECT OF DIFFERENT DOSES OF NITROGEN AND PHOSPHORUS ON ROOT-KNOT NEMATODE AND ITS RHIZOSPHERE MICOFLORA AND NEMATODE FAUNA IN CHICKPEA (*Cicer-arietinum L.*)

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ABSTRACT

Higher number of total bacteria (*Rhizobium* and *Azotobacter*) were recorded in control plots as compared to fertilizers applied plots. Higher total fungal population in plant rhizosphere was observed in control plots. Maximum number of total plant parasitic nematodes were noted in 20 kg nitrogen/hectare. *Meloidogyne* was the predominant genus. Higher saprophytic population was recorded in control plots. Minimum root-knot formation was observed in control plants. Best plant growth was observed in soil amended with 30 kg nitrogen/ hectare followed by 20 kg nitrogen/hectare and in case of phosphorus 60 kg phosphorus/hectare followed by 40 kg phosphorus/ hectare.

Key Words: *Meloidogyne incognita*, micoflora, nematode funna.

Chick-pea is the most important pulse crop of the country. Chick pea occupied a premier position both in area and production. This is consumed in various forms in vegetarian diet and is rich source of protein. Chick-pea attacked by several root diseases that are caused by fugal and nematode/Bilgrami et.al., 1979).

Swaroop and Dasgupta, (1986) Pandey and Singh, (1990) Pant and Pandey (2006). The quality and quantity of available nutrients affect the host plant development, growth rate and different physiological function, and in the way nutrients influence the resistance to pathogen. If plants are given balanced nutrition they develop better tolerance for disease. However, balanced nutrition can be given within a limit. Application of nitrogen more than the amount required by the plants is likely to favour disease development even through it has been balanced with potash and phosphorus. Little know about the application of nitrogen and phosphors susceptible for plant parasitic nematode therefore this study was conducted entitled: Effect of different doses of nitrogen and phosphorus on root knot nematode and its rhizosphere micoflora and nematode fauna in chick-pea (*Cicer-arientium* L.).

MATERIALS AND METHODS

An experiment was conducted in Rabi season during 2007-2008 in NABSRD, Allahabad on chick-pea in microplots. Size of plots was 1m × 2m. Chick-pea cv. type-3 was sown. spacing was 3×5 cm. At 10 days plant were inoculated with *Melodogyne incognita* extracted from papaya plants. Plants were inuculated @ 2500 larva of M. incognita per plant. Plots were irrigated normally. Soil fungi, *Azotobacter* and *Rhizobium* were inoculated in sterilized petridises by the procedure described by Johnson et.al., (1959). 500 gram of soil from each sample was processed for nematode extraction in the following manner as per method given by Southey (1970). At the senescence stage of plant of crop observation were recorded on following parameters viz. root length, shoot length, fresh shoot and root weight, dry weight of root, number of galls per plants, number of nodules per plants, number of egg, egg sacs, juveniles, female and male nematodes. Determination of fungal genera in plant rhizosphere. Extraction of nematodes from soil samples.

Four plant were taken from each treatment plot for purpose of four replication of each treatment in the crop. Data of observation were computed as per the analysis of variance test for randomized block design.

RESULTS AND DISCUSSION

The better growth of shoot length, root weight, root length, number of nodules found in plant with 30 kg nitrogen/ha and 60 kg phosphorus/ha (table 1, 2) may be attributed to quick and easy metabolism of nutrient.

Table 1: Effect of different doses of nitrogen in shoot length fresh shoot weight, root length, fresh root weight, dry shoot weight, number of nodule and root-knot in chick-pea.

Treatment	Shoot length (C.m.)	Fresh shoot weight (gm)	Dry shoot weight (gm)	Root length (C.m.)	Fresh shoot weight (gm)	Nodules No/Plant	Root Knot No./Plant
10Kg Nitrogen/ha	27.66	6.08	2.30	12.75	2.58	0.75	147.50
20Kg Nitrogen/ha	28.38	11.43	3.25	12.85	2.73	0.50	267.00
30Kg Nitrogen/ha	35.50	15.45	6.63	16.00	5.75	1.00	162.25
Control	24.00	3.90	1.09	10.50	1.70	0.50	60.00
F. Test (P=0.05)	S	S	S	S	S	NS	S
L.S.D. (P=0.05)	5.11	4.64	1.94	2.07	1.49	--	62.85

Table 2: Effect of different doses of phosphorus on shoot length, fresh shoot weight, root length, fresh root weight, number of nodule and root-knot in chick-pea.

Treatment	Shoot length (C.m.)	Fresh shoot weight (gm)	Dry shoot weight (gm)	Root length (C.m.)	Fresh shoot weight (gm)	Nodules No/Plant	Root Knot No./Plant
20Kg Phosphorus/ha	37.00	17.25	4.95	14.75	4.43	2.75	332.50
40Kg Phosphorus/ha	40.25	23.65	7.50	14.75	5.43	2.75	435.25
60Kg Phosphorus/ha	42.75	29.58	9.53	18.75	8.78	4.00	213.75
Control	24.00	3.90	1.09	10.50	1.70	0.50	60.00
F. Test (P=0.05)	S	S	S	S	S	S	S
L.S.D. (P=0.05)	7.22	5.89	1.65	3.44	0.87	2.06	118.02

Table 3: Effect of different doses of nitrogen on egg sac, egg, juvenile, male and female nematodes in chickpea.

Treatment	Egg sac No./Plant	Egg No./Plant	Juvenile No./Plant	Male No./Plant	Female No./Plant
10Kg Nitrogen/ha	176.00	313.75	1945.75	3.75	160.00
20Kg Nitrogen/ha	265.00	351.25	2924.00	4.50	290.00
30Kg Nitrogen/ha	205.00	334.75	1164.00	2.25	185.00
Control	101.00	184.00	3306.00	0.75	75.00
F. Test (P=0.05)	S	S	S	NS	S
L.S.D. (P=0.05)	10.52	91.12	117.41	---	25.77

Table 4: Effect of different doses of phosphorus on egg sac, egg, juvenile, male and female nematode in chickpea plant

Treatment	Egg sac No./Plant	Egg No./Plant	Juvenile No./Plant	Male No./Plant	Female No./Plant
20Kg Phosphorus/ha	405.00	404.50	59419.00	1.50	350.00
40Kg Phosphorus/ha	820.00	587.25	9272.00	3.00	465.00
60Kg Phosphorus/ha	200.00	373.75	13456.00	1.50	225.00
Control	101.00	184.00	3306.00	0.75	75.00
F. Test (P=0.05)	S	S	S	NS	S
L.S.D. (P=0.05)	37.87	185.67	3623.36	---	23.76

Table 5: Total number of rhizosphere bacteria (in 10^4/g soil) in chickpea.

Treatment	Rhizobium	Azotobacter
10Kg Nitrogen/ha	127.77	94.44
20Kg Nitrogen/ha	146.66	93.99
30Kg Nitrogen/ha	106.66	87.66
Control	412.50	128.30
F. Test (P=0.05)	S	S
L.S.D. (P=0.05)	177.06	36.82

Table 6: Total number of rhizosphere bacteria (in 10^4/g soil) in chickpea.

Treatment	Rhizobium	Azotobacter
20Kg Phosphorus/ha	81.48	100.75
40Kg Phosphorus/ha	56.45	30.20
60Kg Phosphorus/ha	116.66	122.38
Control	412.50	128.33
F. Test (P=0.05)	NS	S
L.S.D. (P=0.05)	-----	51.05

Total 7: Total number of rhizosphere fungi (in 10^3/gram soil) and percentage predominance of various genera in chickpea

Sl.No.	Treatment	10 Kg N/ha		20 Kg N/ha		30 Kg N/ha		20 Kg P/ha		40 Kg P/ha		60 Kg P/ha		Control	
	Name of Fungi	Mean	%	Mean	%	Mean	%	Mean	%	Mean	%	Mean	%	Mean	%
1.	As pergillus terreus	2.66	5.02	18.26	38.25	20.40	31.57	0.88	1.82	0.93	37.49	4.57	23.18	51.00	64.96
2.	A. niger	4.66	8.78	11.06	23.17	4.00	6.19	8.66	17.80	0.18	7.48	4.28	21.73	6.00	7.64
3.	A. nidulans	—	—	1.73	3.62	—	—	—	—	—	—	—	—	6.00	7.64
4.	A. flavus	—	—	0.13	0.27	—	—	—	—	—	—	—	—	2.50	3.18
5.	A. sydowi	—	—	0.40	0.83	—	—	—	—	—	—	0.85	4.34	4.00	5.09
6.	Cunninghamella bertholletiae	—	—	0.42	0.88	1.00	1.54	—	—	—	—	9.71	49.27	0.50	0.63
7.	Fusarium sp.	40.88	76.99	0.93	1.95	38.40	59.44	37.33	76.71	0.62	25.01	—	—	7.00	8.91
8.	Fusarium moniliforme	—	—	14.53	30.43	—	—	—	—	—	—	—	—	1.50	1.91
9.	Shite sterilemycelium	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10.	Rhizopus nigricans	2.88	5.43	0.13	0.69	0.20	0.30	0.66	1.36	0.75	30.01	0.28	1.44	—	—
11.	Penicillium citrinum	—	—	—	—	0.40	6.19	0.22	0.45	—	—	—	—	—	—
12.	Curvularia lunata	1.11	2.09	—	—	0.20	0.30	0.88	1.82	—	—	—	—	—	—
13.	Thelovia terricola	—	—	0.13	0.69	—	—	—	—	—	—	—	—	—	—
14.	Monosporium	0.88	1.67	—	—	—	—	—	—	—	—	—	—	78.50	—
	Total	53.10	—	47.75	—	64.60	—	48.66	—	2.49	—	19.71	—	—	—

Total 8: Total number of rhizosphere nematode and percentage predominance of various genera in chickpea

Sl.No.	Treatment / Name of nematode	10 Kg N/ha		20 Kg N/ha		30 Kg N/ha		20 Kg P/ha		40 Kg P/ha		60 Kg P/ha		Control	
		Mean	%	Mean	%	Mean	%	Mean	%	Mean	%	Mean	%	Mean	%
1.	Saprophyte	165.00	—	178.75	—	179.75	—	128.75	—	150.00	—	148.75	—	242.50	—
2.	*Meloidogyne sp.*	256.25	38.25	285.00	41.99	260.00	38.30	226.25	40.98	293.25	44.80	230.00	45.14	175.00	26.04
3.	Hoplolaimus	155.00	23.02	135.00	19.88	177.75	26.18	117.75	21.51	145.75	22.26	119.25	23.40	175.75	26.15
4.	Helicotylenchus	153.75	22.83	175.00	25.78	148.50	21.87	125.75	22.78	121.25	18.52	75.75	14.86	150.00	22.32
5.	Tylenchulus	20.00	2.97	21.25	3.13	15.00	2.20	15.00	2.71	6.25	0.95	13.75	2.69	36.00	5.35
6.	Rotylenchulus	2.50	0.37	8.75	1.28	2.50	0.36	3.75	0.67	15.50	2.36	—	—	16.25	2.41
7.	Aphelenchoidaes	15.00	2.22	5.00	0.73	10.00	1.47	6.25	1.13	15.00	2.29	15.00	2.94	31.75	4.72
8.	Tylenchorhynchus	48.75	7.24	43.75	6.44	55.00	8.10	51.25	9.28	42.50	6.49	55.75	10.94	72.25	10.75
9.	Xiphinema	10.00	1.48	2.50	0.36	—	—	5.00	0.90	2.50	0.38	—	—	2.50	0.37
10.	Longidorus	5.00	0.74	—	—	—	—	—	—	10.00	1.51	—	—	—	—
11.	Pratylenchus	5.00	0.74	2.50	0.36	5.00	0.73	—	—	2.50	0.38	—	—	2.50	0.37
12	Trichodorus	2.00	0.29	—	—	5.00	6.73	—	—	—	—	—	—	10.00	1.48
	Total	673.25	—	678.75	—	678.75	—	551.98	—	654.50	—	509.50	—	672.00	—

Data on the effect of nitrogen and phosphorus indicated significant difference in shoot length, fresh shoot weight, dry shoot weight, root length and fresh root weight and number of root knot except number of nodules in chick-pea. In case of phosphorus number of nodes was also significant.

The maximum of number of root-knot was recorded in the treatment 20kg N/ha and 40kg phosphorus per/ha. This may be due to the nematode getting proper and optimum pabulum for their multiplication and development. There was reduction in total population of fungi and bacteria in rhizosphere soil (Table 5, 6, 7). Similar results were reported by Kaufman and William (1964), Upadhyay and Mukhopadyay (1985). The reduction in population of fungi may the boxic effect of fertilizer on fungi. The reduction growth of bacteria (*Rhizobium* and *Azotobacter*) population may be attribute to the various soil factors like soil types and other condition related with the soil. The maximum reduction in nematode population is noted in 60kg. Phosphorus/ ha (Table 8). There is general reduction in nematode population in the fertilizer applied plot as compare with control plot. This may be attributed to the toxic effect of fertilizers on nematode.

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