

## IMMUNOPATHOLOGICAL EFFECTS OF ASCARIDIA GALLI INFECTION ON SPLEEN BY CHICKS INDUCED BY ALBENDAZOLE TREATMENT

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### Abstract

*Newly hatched W.L.H. chicks were infected with Ascaridia galli eggs low dose (500 eggs) and high dose (1500 eggs) and subsequently treated with albendazole (anthelmintic drug). After 15 and 30 days of post infection and treatment spleen showed various pathological changes. With low dose of infection the capsular was ruptured at various places and white pulp showed inflammatory edema and presence of secondary nodules. The high dose of infection caused separation of inner capsular wall with inflammatory and non inflammatory edema. Sinusvenosus showed lymphoid hyperplasia.*

**Keywords:** Chicks, eggs, albendazole, *Ascaridia galli*, spleen.

Poultry industry forms a major portion of the agriculture sector in developing countries including India. During last two decades, India has had a remarkable growth in poultry industry. Ascariasis is still a cause of economic losses in modern poultry farming (Permin and Ranvig, 2001). It is an intestinal worm and chickens under three months of age are mostly susceptible to it. Larval stages of *A. galli* of chicks generally causing anaemia, hyperproteinemia and other hyperplastic severe pathological disorders including haemorrhagic inflammation associated with

edema. The advanced stage of infection results into various histopathological, haematological and biochemical changes in the host.

### MATERIALS AND METHODS

Newly hatched white leg horn chicks (W.L.H.) were procured from Salim hatchery Meerut. Before experiments the chicks were housed in clean wood and steel cages in animal houses and acclimatized to laboratory conditions (Temp.  $36 \pm 2$ , light 18 h, D. 6h period). They were fed on formulated chick feed of Hindustan Poultry Feed Ltd., India. All the chicks provided feeding and water properly in the evening and morning. The feeding was stopped 24h before commencement of experiments to avoid metabolic variations due to diet.

### Collection of parasites

The adult parasitic forms of *A. galli* are found in the intestine of fowl. Parasites were recovered from the intestine of freshly slaughtered fowl from local slaughter house. Intestine were cut, adult worm were collected from the intestine. The adult parasites were washed in double distilled water and than processed for the experiment. These parasites were kept into the lock lewis solution for egg laying. The pure embryonated 250 eggs were administered to laboratory maintained chicks.

After 30 days whenever infective eggs were required, the parasites were collected from infected chicks maintained in laboratory. The chicks were autopsied and mature male and females parasites were obtained from the above chicks. All the experiments were done from the pure eggs obtained from experimentally infected chicks.

### Chronic exposure

For the chronic experiments healthy chicks weight  $240 \text{ gm} \pm 10 \text{ gm}$  were selected and treated with albendazole for anthelmintic studies, chicks were divided into following groups-

Group-I- Healthy chicks (uninfected Control)-

Group-II-Chicks infected with 500 embryonated eggs of *A.galli* – 6 chicks

Group-III-Chicks infected with 1500 embryonated eggs of *A.galli* – 6 chicks

Group-IV-Chicks infected with 500 embryonated eggs of and treated with albendazole – 6 chicks

Group-V-Chicks infected with 1500 embryonated eggs of and treated with albendazole – 6 chicks

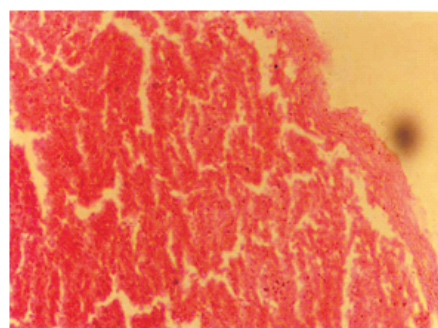
Each groups contained 6 chicks which were regularly checked for activity, behaviour and weight and other related condition during the entire tenure of experimentation for the present study.

Chicks were anesthetized decapitated and autopsy was performed. Spleen were removed and placed in 10% neutral buffer

formaline. Organ sample were processed by standard histopathological techniques. Sections were stained with hematoxylin and eosin for light microscopic examination. Most of the microphotograph have been taken in low as well as high magnification in order to study various histopathological changes.

## RESULTS AND DISCUSSION

### Group (I)- Structure of spleen (Healthy Control) [Fig. 1]



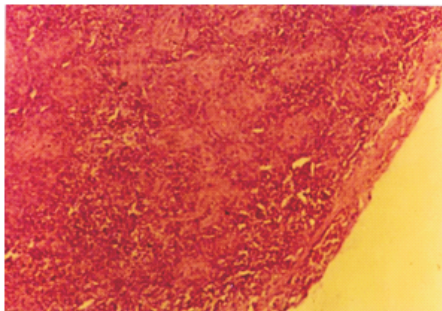
**Fig. 1:** T.S. passing through the spleen of control group showing capsular wall, blood vessels, trabeculae. X200

The transverse section of spleen from control group of chicks revealed following structures. The spleen has two regions (1) Capsule and (2) Subcapsule. Capsule was made up of an outer and inner layer of collagen and elastic fibres. Subcapsule was broadly divided into two regions (i) Red pulp and (ii) White pulp

**Red Pulp :** Red pulp was observed to be a loose sponge tissue composed of ramifying cellular cords surrounded by venous sinuses. Venous sinuses were observed to be passage lined by flattened and elongated littoral cells. The tissue of red pulp area was basically composed of reticular cells and their fibres with a number of scattered large lymphocytes and macrophages.

**White Pulp:** White pulp observed to be diffused area and predominantly surrounding the spleen arteries. The white pulp area surrounded by red pulp tissue and having small and medium sized lymphocytes.

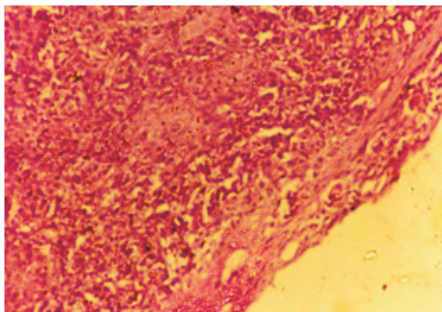
**Group (II) - Infected with 500 embryonated eggs of *A. galli* (15<sup>th</sup> day of PI, [Fig. 2]**



**Fig. 2:** T.S. passing through the spleen of infected with low dose of infection showing red pulp area and white pulp area after 15 days. X200

Here considerable pathological changes were observed in capsular wall. The red pulp area became noticeably (wide) detached from capsular wall. There was congested sinuses observed. Few lymphocytes were focally infiltrated in capsular wall. Non inflammatory edema was also observed in red pulp area.

**30<sup>th</sup> day of PI [Fig. 3]**

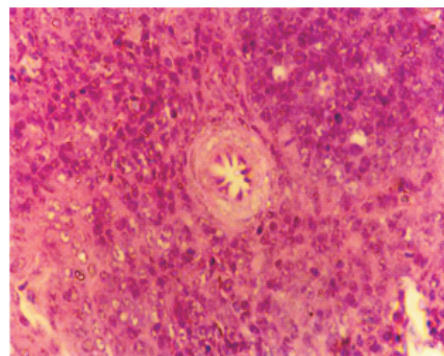


**Fig. 3:** T.S. passing through the spleen of infected with high dose of infection showing degenerative change in capsular wall, white pulp area and red pulp area after 30 days of PI.

X200

In This section cloudy swelling was observed in white pulp area. The artery was very much dilated. Red pulp area found slightly detached from white pulp. Rest part of red and white pulp area have numerous lymphocytes cells. Non inflammatory edema was also observed in red pulp area.

**Group (III) - Infected with 1500 embryonated eggs of *A. galli* 15<sup>th</sup> Day of PI [Fig. 4]**



**Fig. 4:** T.S. passing through the spleen of infected with low dose of infection showing degenerative changes in white pulp area having small artery and red pulp area after 15 days of PI. X200

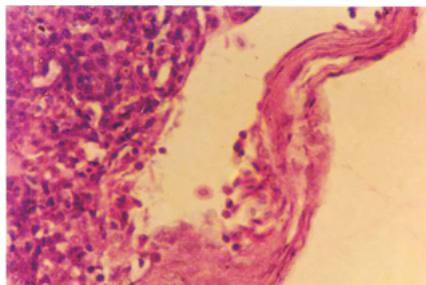
Noticeable inflammatory edema was observed in outer layer of capsular wall. Red pulp tissue were observed to be loosely packed spongy tissue. At some places red pulp tissue showed detachment from capsular wall. Cloudy swelling was also observed in reticular tissue.

**30<sup>th</sup> day of PI [Fig. 5]**

At 30<sup>th</sup> day of challenge infection hyperplasia of sheathed arteries was observed in white pulp area. white and red pulp had large number of lymphocytes. Red pulp area also contained highly dilated venous sinuses. Non-

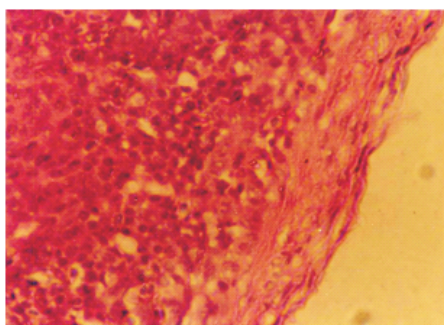


inflammatory edema was also observed in red pulp area.

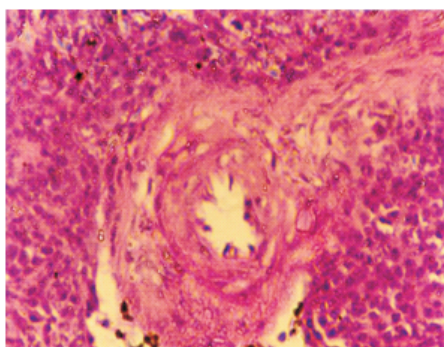


**Fig. 5:** T.S. passing through the spleen of infected with high dose showing sinusoidal congestion due to huge patches of red blood cells and red pulp after 30 days of PT. X200

**Group (IV) - Infected with low dose (500 embryonated eggs) of *A. galli* treated with albendazole after 15<sup>th</sup> and 30<sup>th</sup> day of Post infection and Post treatment [Fig. 6, 7]**



**Fig. 6:** T.S. passing through the spleen of infected with low dose showing red pulp area and thick capsular wall after 15 days of LPI/PT. X200



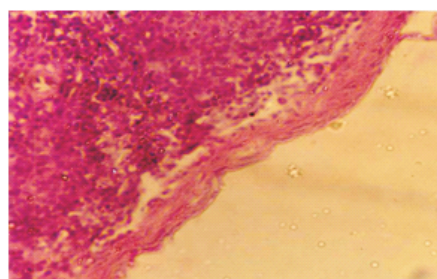
**Fig. 7:** T.S. passing through the spleen infected with high dose of infection showing dilated

artery after 30 days of PI/PT. X200

After 15 days of post infection spleen capsular wall was found to be normal in appearance. Capsules wall was found to be normal but separated at certain places. The white pulp revealed presence of secondary nodules. It was observed that the number of lymphocyte decreased with in white pulp area. The wall of blood arteries was found to be thickened. Lymphoid hyperplasia was observed to be well marked. The red pulp tissue revealed congested venous sinuses.

After the 30 days of post infection spleen revealed the following changes. The white pulp tissue revealed the depletion of lymphocytes. Congestion of venous sinuses was found to be prominent. In red pulp area inflammatory and non-inflammatory edema was observed at certain places various secondary nodules were present. Depletion of lymphocytes and cloudy swelling in red pulp area were observed. The reticular tissue of red and white pulp area showed irregular and highly dilated venous sinuses.

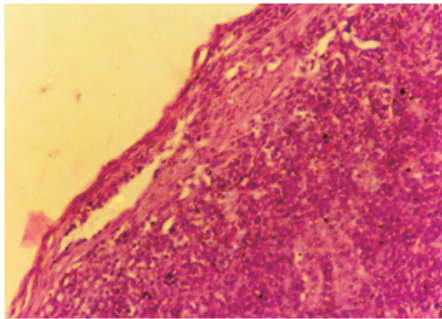
**Group (V) - Infected with high dose (1500 embryonated eggs) of *A. galli* treated with albendazole after 15<sup>th</sup> and 30<sup>th</sup> day of Post infection and Post treatment [Fig. 8, 9]**



**Fig. 8:** T.S. passing through the spleen infected with low dose of infection showing non-inflammatory edema in capsular wall,



depletion of lymphocytes in red pulp area and small artery in white pulp area after 15 days of PI/PT. X200



**Fig. 9:** T.S. passing through the spleen infected with high dose of infection showing thick capsular wall, inflammatory edema after 30 days of LPI. X200

After 15 days of Pi and PT vacuolization and inflammatory edema were well marked in outer and inner capsules wall. Outer capsules wall slightly thickened and showing necrosis at various places. The white pulp tissue revealed the severe depletion of lymphocytes. Well marked presence of few eosinophiles, plasma cells and the transformed lymphocytes was observed. The red pulp tissues were observed to be loosely packed spongy tissue, beneath the capsules wall. The depletion of lymphocytes was found to be prominent with congested sinuses. Inflammatory and non inflammatory edema were evident.

After 30 days of post infection the elastocollagenous capsular wall appeared as wavy structure and infiltrated with inflammatory cells. At some places the capsular wall became quite thick vacuolated and showing distinct non inflammatory edema. The white pulp tissue revealed high dilation of splenic artery which showed very thick walls with infiltration of blood cells and

inflammatory cells. The lumen of the artery also revealed infiltration of inflammatory cells. It also revealed depletion of lymphocytes cloudy swelling was observed in the white pulp area. The red pulp showed abundant number of lymphocyte. The reticular tissue showed very enlarged secondary nodule infiltrated with blood cells and inflammatory cells around nodule inflammatory edema was observed. The venous sinuses were also dilated secondary nodule also showed vacuolization.

The present investigation have revealed that the experimental *A. galli* infection and albendazole treatment marked immunopathological changes in spleen of W.L.H. chicks due to low and high dose of *A. galli*. The capsular wall of spleen was found to be quite thick and ruptured whereas red and white pulp revealed inflammatory edema with eosinophils and macrophages. The high dose of infected chicks revealed marked immunopathological changes marked hyperplasia of follicles were observed during resent investigation due to formation of secondary lymphoid nodule. The appearance of secondary lymphoid nodule were spleen associated with an infective process as they always found in the spleen of injected and treated chicks but were absent in control chicks. Splenic congestion and inflammatory and noninflammatory edema were observed in infected and treated group of W.L.H. chicks may be due to presence of scattered erythrocyte and lymphocyte. Depletion of lymphoid cells were observed in spleen of broiler chicks (Stoev et al. 2000; Tanigueri, et al., 1977). Wedderburn (1974) observed hypertrophy of spleen. Macrophages living in the spleen sinuses would infair normal blood flow that may effect in experimental parasitic disease. Similar changes

were observed in spleen having parasitic infections (Rogers et al. 1975).

Vincent and Ash (1978) reported in the changes of spleen during the course of infection with *B. Malayi*, *B. pahangi* and *B. pateri* has been thoroughly examined. The histology associated with *longicallum alemmiscus* in spleen revealed variable amount of cellular infiltration (Frank 1993).

Hyperplastic follicles contained germinal centers and lingible bodies. The pararteriol area of spleen were well developed and showed no depletion of lymphocyte (Chandra, 1985).

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## EFFECT OF FYM ON THE UPTAKE OF LEAD METALS BY CORIANDER

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### ABSTRACT

**A field experiment was conducted on alluvial soil of Sheila Dhar Institute Experimental Farm, Allahabad to study the effect of organic matter (FYM) on the uptake of lead by Coriander. Three levels of FYM (0, 10 and 20 t ha<sup>-1</sup>) and Pb (0, 10 and 20 mg kg<sup>-1</sup>) were applied as FYM and Pb (CH<sub>3</sub>COOH)<sub>2</sub>, respectively. Addition of 20 t ha<sup>-1</sup> FYM increased the maximum Shoot dry biomass yield of Coriander by 28.46% over the control respectively. The application of 20 mgkg<sup>-1</sup> Pb maximum reduced dry biomass yield of Coriander by 12.81% compared to control and registered the highest accumulation of Pb in shoot of Coriander by 2.84 mg kg<sup>-1</sup>, respectively. Therefore, 20 t ha<sup>-1</sup> FYM application may be recommended to enhance biomass yield of Coriander and reducing the uptake of Pb by Coriander. The response of FYM was observed ameliorative in Pb-contaminated plots.**

**Key Words:** Lead, uptake, FYM, coriander

Several studies have indicated that vegetables, particularly leafy crops, grown in heavy metal contaminated soils have higher concentrations of heavy metals than those grown in uncontaminated soil (Guttormsen et

al. 1995; Dowdy and Larson 1995). A major pathway of soil containing through atmospheric deposition of heavy metals from point sources such as, metal smelting and industrial activities. Other non point sources of contamination affecting agricultural soils include inputs such as, fertilizers, pesticides, sewage sludge and organic matter (Singh 2001).

Heavy metal contamination can be a consequence of industrial activities that eliminate residues in the soil that in long term promote their accumulation. The majority of the sources are originated by human actions like metal manufacture and mining industries with storage, disposal and transportation problems (Glick, 2003). Among the metals found more frequently there are Cd, Pb, Co, Cu, Hg, Ni, Si and Zn. For Cd, Pb, Cu and Zn, their toxicity increases as follows: Pb < Zn < Cu < Cd, depending on countless abiotic and biotic factors (Zenker et al., 2005).

Among vegetables, leafy vegetables are more vulnerable than vegetables belonging to root, solanaceous and cucurbit groups to heavy metal pollution, particularly in wastewater-irrigated soils (Sachan *et al.*, 2007). The present investigation was carried out to effect of organic matter (FYM) on the uptake of heavy metals in Coriander. In addition, the concentrations at



which Pb exhibited toxic effects in Coriander crops and soil was evaluated.

## MATERIALS AND METHODS

### Plant Material and Experimental Layout

The Sheila Dhar Institute experimental site, covers an area of 1 hectare, is located at Allahabad in northern India at 25°57' N latitude, 81 ° 50' E longitudes and at 120±1.4 m altitude. A sandy clay loam soil, derived from Indo-

Gangetic alluvial soils, situated on the confluence of rivers Ganga and Yamuna alluvial deposit, was sampled for the study. The texture was sand (>0.2 mm) 55.54%, silt (0.002-0.2 mm) 20.32% and clay (<0.002 mm) 24.25%. The detailed physico-chemical properties of the investigated soil have been given in the Table 1:-

Table- Physico-chemical properties of the Sheila Dhar Institute (SDI) Experimental Farm,

Parameters	Values
Texture: Sandy Clay Loam (Sand, Silt and Clay %)	(55.54,20.32 and 24.25, respectively)
pH	7.8
EC(dSm <sup>-1</sup> ) at 25°C	0.28
Organic Carbon (%)	0.56
CEC [C mol (p <sup>+</sup> ) kg <sup>-1</sup> ]	19.8
Total Nitrogen (%)	0.08
Total Phosphate (%)	0.07
DTPA-extractable Pb (ppm)	0.28

Allahabad, India

### Experimental

After systematic survey factorial experiment was conducted to study the effect of single super phosphate on the uptake of cadmium by Coriander (*Brassica rapa* L). The experiment was replicated thrice with nine treatments and conducted in completely factorial randomized block design (factorial RBD). After 24 hr of the treatment seeds were sown. Soil moisture was maintained by irrigating the crops at interval of 5-6 days.

Coriander was grown successively in the 27 plots (each of 1m<sup>2</sup> in area). The treatments of Pb × FYM relationship consisted of 0, 10 and 20 t ha<sup>-1</sup> FYM along with 0, 10 and 20 mg kg<sup>-1</sup> Pb. The source of Pb and Organic Matter were Pb(CH<sub>3</sub>COOH)<sub>2</sub> and FYM respectively. The crop was harvested at 60 days after sowing (DAS).

The treatment combinations were as follows:-

(1).  $A_0B_0$  (Control), (2).  $A_1B_0$  [Low dose of Lead ( $10 \text{ mg kg}^{-1} \text{ Pb}$ )], (3).  $A_2B_0$  [High dose of Lead ( $20 \text{ mg kg}^{-1} \text{ Pb}$ )], (4).  $A_0B_1$  [Low dose of FYM ( $10 \text{ t ha}^{-1}$ )], (5).  $A_0B_2$  [High dose of FYM ( $20 \text{ t ha}^{-1}$ )], (6).  $A_1B_1$  [Low dose of Lead and FYM ( $10 \text{ mg kg}^{-1} \text{ Pb}$  along with  $10 \text{ t ha}^{-1} \text{ FYM}$ )], (7).  $A_1B_2$  [Low dose of Pb ( $10 \text{ mg kg}^{-1}$ ) and High dose of FYM ( $20 \text{ t ha}^{-1}$ )], (8).  $A_2B_1$  [High dose of Lead ( $20 \text{ mg kg}^{-1}$ ) and Low dose of FYM ( $10 \text{ t ha}^{-1}$ )], (9).  $A_2B_2$  [High dose of Lead and FYM ( $20 \text{ mg kg}^{-1} \text{ Pb}$  along with  $20 \text{ t ha}^{-1} \text{ FYM}$ )].

### Soil Sampling

The larger fields were divided into suitable and uniform parts, and each of these uniform parts was considered a separate sampling unit. In each sampling unit, soil samples were drawn from several spots in a zigzag pattern, leaving about 2 m area along the field margins. Silt and clay were separated by Pipette method and fine sand by decantation (Chopra and Kanwar, 1999).

### Extraction for Lead Content in Soil

For total Pb content, one gram of soil was mixed in 5 ml of  $\text{HNO}_3$  (16M, 71%) and 5 ml of  $\text{HClO}_4$  (11 M, 71%). The composite was heated up to dryness. The volume was made up to 50 ml with hot distilled water. The samples were filtered using Whatman filter paper 42 (42.5mm). The clean filtrate was used for the estimation of cadmium using Atomic Absorption Spectrophotometer (AAS) (AAnalyst600, PerkinElmer Inc., MA, USA) (Kumar and Mani, 2010).

### Soil physico-chemical analysis

Soil pH was measured with 1:2.5 soil water ratio using Elico digital pH meter (Model LI 127, Elico Ltd., Hyderabad, India) at authors' laboratory. Double distilled

water was used for the preparation of all solutions. Organic carbon was determined by chromic acid digestion method, cation exchange capacity (CEC) by neutral 1 N ammonium acetate solution, total nitrogen by digestion mixture (containing sulphuric acid, selenium dioxide and salicylic acid) using micro-Kjeldahl method, Glass Agencies, Ambala, India. Total phosphorus by hot plate digestion with  $\text{HNO}_3$  (16M, 71%) and extraction by standard ammonium molybdate solution (Chopra and Kanwar 1999; Kumar and Mani 2010).

### Plant analysis

Plants were harvested after 60 days having higher phyto-chemicals at their maturity stage as suggested by Mani et al. (2012). Samples were carefully rinsed with tap water followed by 0.2 % detergent solution, 0.1N HCl, de-ionized water, and double distilled water.

Samples were dried in a hot-air oven at a temperature of  $60^\circ\text{C}$  and ground to a fine powder. Plant dry biomass weight was recorded. One gram of ground plant material was digested with 15 ml of tri-acid mixture (Kumar and Mani, 2010) containing conc.  $\text{HNO}_3$  (16M, 71%),  $\text{H}_2\text{SO}_4$  (18M, 96%) and  $\text{HClO}_4$  (11M, 71%) in 5:1:2, heated on hot plate at low heat ( $60^\circ\text{C}$ ) for 30 minutes and cadmium were determined by the Atomic Absorption Spectrophotometer (AAnalyst600, PerkinElmer Inc., MA, USA).

### Statistical Analysis

Data were analyzed by factorial analysis of variation (ANOVA) using various treatments as independent factors with the help of the sum of square (SS) and degree of freedom (DF). The

standard error (SE) is given by 
$$SE = \sqrt{\frac{2V_E}{n}}$$

where,  $V_E$  is the variance due to the error,  $n$  is the number of replications, and the critical difference (CD) is given by  $CD = SE_{diff} \times t_{5\%}$  ( $t_{5\%} = 2.042$  at  $DF_{error} = 30$  was observed) and standard deviation (SD) were determined in accordance with (Motulsky and Christopoulos, 2003).

## RESULT AND DISCUSSION

### Effect of Pb × FYM interaction on dry biomass yield of Coriander

The data (Table 1) indicate highly significant effect of Pb, FYM, and Pb × FYM interaction on influencing the dry biomass yield of Coriander. Addition of FYM @ 20 t ha<sup>-1</sup> increased the dry biomass yield of coriander by 28.29 % over the control. Added single doses of Pb 10 mg kg<sup>-1</sup> (T<sub>4</sub>) and 20 mg kg<sup>-1</sup> (T<sub>7</sub>) individually reduced the dry biomass of Coriander by 4.39 % and 12.81 % over the control, respectively. The addition of combined treatment Pb 10 mg kg<sup>-1</sup> + FYM 10 t ha<sup>-1</sup> and Pb 20 mg kg<sup>-1</sup> + FYM 10 t ha<sup>-1</sup> individually

increased the dry biomass yield of Coriander by 6.17 % and 7.71 % over the control, respectively, Sakal et al., (1992) and Eriksson et al., (1988) have also reported almost similar findings. The added combined treatment Pb 10 mg kg<sup>-1</sup> + 20 t ha<sup>-1</sup> and Pb 20 mg kg<sup>-1</sup> + 20 t ha<sup>-1</sup> increased dry biomass yield of Coriander by 29.16 % and 20.06 % over the control, respectively (fig. 1 & 2). It may be concluded that organic matter has been found ameliorative in combating soil pollutants. Yamamoto and Watanabe (1996) have also reported almost similar findings.

The study of Pb × FYM interaction concluded that Pb alone decreased the dry biomass yield of Fenugreek but with FYM dry biomass yield was affected variably. Organic matter alone increased the dry biomass yield of Coriander but the increase percentage was less compared to the control. The reduction of dry biomass yield by Pb toxicity could be the direct consequence of the inhibition of chlorophyll synthesis and photosynthesis (Padmaja et al., 1990). The most common effect of Pb toxicity in plants is stunted growth, leaf chlorosis and alteration in the activity of many key enzymes of various metabolic pathways (Arduini et al., 1996).

**TABLE-1.d: Effect of Pb × FYM interaction on dry biomass yield of Coriander (g/plots)**

Treatments (Pb mg kg <sup>-1</sup> ), FYM (t ha <sup>-1</sup> )	Replication			
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Mean
Pb 0 + FYM 0	228	200	220	216.00
Pb 0 + FYM 10	262	260	250	257.33
Pb 0 + FYM 20	280	282	270	277.33
Pb 10 + FYM 0	210	200	206	205.33
Pb 10 + FYM 10	240	228	220	229.33
Pb 10 + FYM 20	285	270	282	279.00
Pb 20 + FYM 0	180	195	190	188.33
Pb 20 + FYM 10	220	238	240	232.67
Pb 20 + FYM 20	260	268	250	259.33

C.D. = 7.65

S.E. = 16.22



**ANOVA TABLE**

Source of Variation	D.F.	S.S.	M.S.S.	Variation Ratio	F-Table	
					5%	1%
Replication	2	78.30	39.15	0.45	3.63	6.23
SS due to FYM	2	2720.07	1360.04	15.49**	3.63	6.23
SS due to Pb	2	7184.30	3592.15	40.93**	3.63	6.23
SS due to FYM × Pb	4	14628.59	3657.15	41.67**	3.01	4.77
Error	16	1404.37	87.77			

\*\*Significant at 1% level of significance

**Effect of Pb × FYM interaction on Pb concentration in shoots and roots of Coriander**

The data presented in table (1.e & 1.f) indicate significant effect of Pb, FYM, and interaction of Pb × FYM on lead accumulation

by shoot and root both parts of plants. Application of 20 mg kg<sup>-1</sup> Pb (T<sub>7</sub>) drastically promoted the accumulation of Pb by almost 3.19-3.27 folds in shoot and root over the control, respectively. Similar findings have been also reported by Bigdeli and Seilsepour (2008).

**TABLE-1e: Effect of Pb × FYM interaction on Pb concentration in shoot of Coriander (mg kg<sup>-1</sup>)**

Treatments Pb (mg kg <sup>-1</sup> ), FYM (t ha <sup>-1</sup> )	Replication			
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Mean
Pb 0 + FYM 0	0.9	0.96	0.8	0.89
Pb 0 + FYM 10	0.5	0.68	0.48	0.55
Pb 0 + FYM 20	0.46	0.58	0.44	0.49
Pb 10 + FYM 0	1.6	1.74	1.78	1.71
Pb 10 + FYM 10	1.34	1.36	1.45	1.38
Pb 10 + FYM 20	1.1	1.14	1	1.08
Pb 20 + FYM 0	2.8	2.78	2.94	2.84
Pb 20 + FYM 10	1.56	1.4	1.52	1.49
Pb 20 + FYM 20	1.2	1.32	1.28	1.27

C.D. =0.06

S.E. =0.14

**ANOVA TABLE**

Source of Variation	D.F.	S.S.	M.S.S.	Variation Ratio	F-Table	
					5%	1%
Replication	2	0.01	0.01	1.05	3.63	6.23
SS due to FYM	2	6.54	3.27	491.07**	3.63	6.23
SS due to Pb	2	0.75	0.38	56.52**	3.63	6.23
SS due to FYM × Pb	4	4.74	1.18	177.82**	3.01	4.77
Error	16	0.11	0.01			

\*\*Significant at 1% level of significance

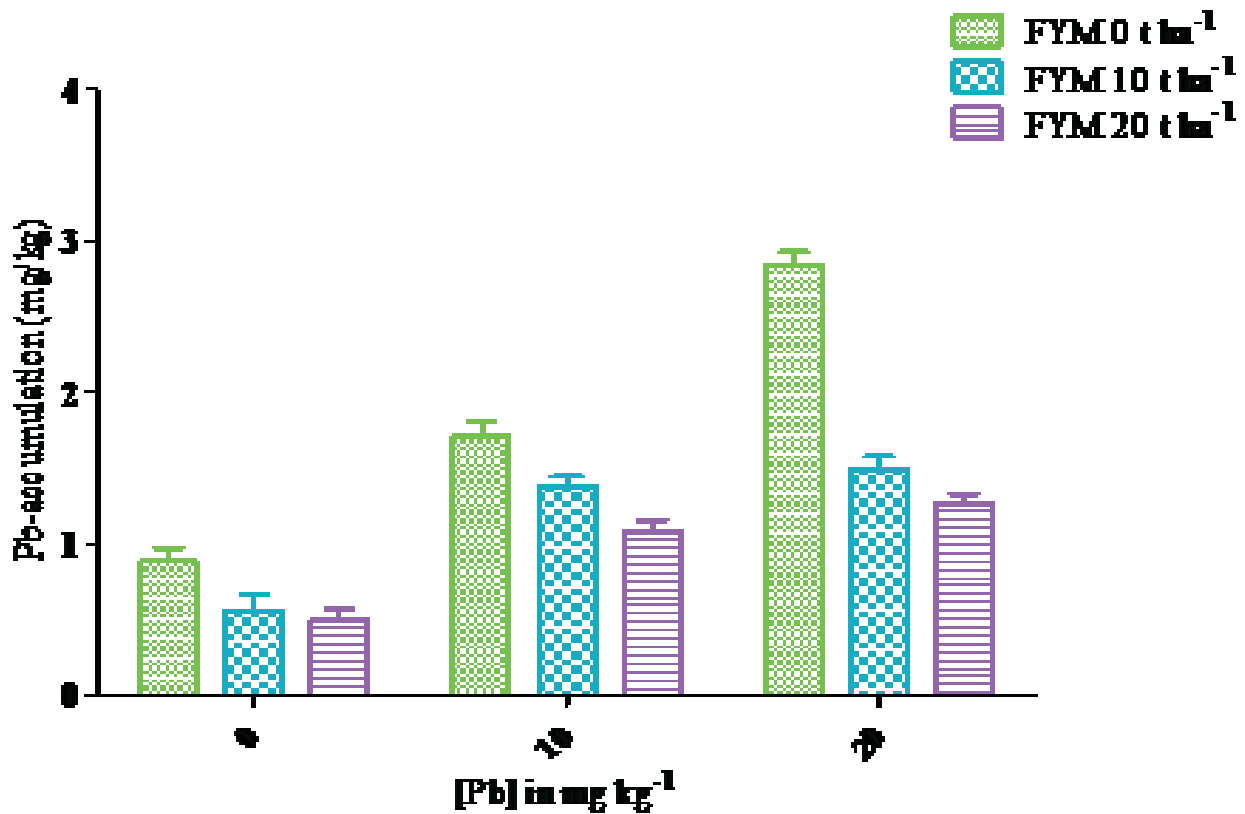


Fig.1 e: Effect of Pb × FYM interaction on Pb concentration in shoot of Coriander (mgkg<sup>-1</sup>)

**TABLE-1.f: Effect of Pb × FYM interaction on Pb concentration in root of Coriander (mg kg<sup>-1</sup>)**

Treatments (Pb mg kg <sup>-1</sup> ), FYM (kg ha <sup>-1</sup> )	Replication			
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	Mean
Pb 0 + FYM 0	0.56	0.65	0.74	0.65
Pb 0 + FYM10	0.58	0.46	0.62	0.55
Pb 0 + FYM 20	0.56	0.42	0.56	0.51
Pb 10 + FYM 0	1.32	1.34	1.51	1.39
Pb 10 + FYM10	1.2	1.12	1.3	1.21
Pb 10 + FYM 20	0.92	0.98	0.9	0.93
Pb 20 + FYM0	2.45	2.28	2.36	2.36
Pb 20 + FYM 10	1.8	1.76	1.70	1.75
Pb 20 + FYM 20	1.1	1.00	1.12	1.07

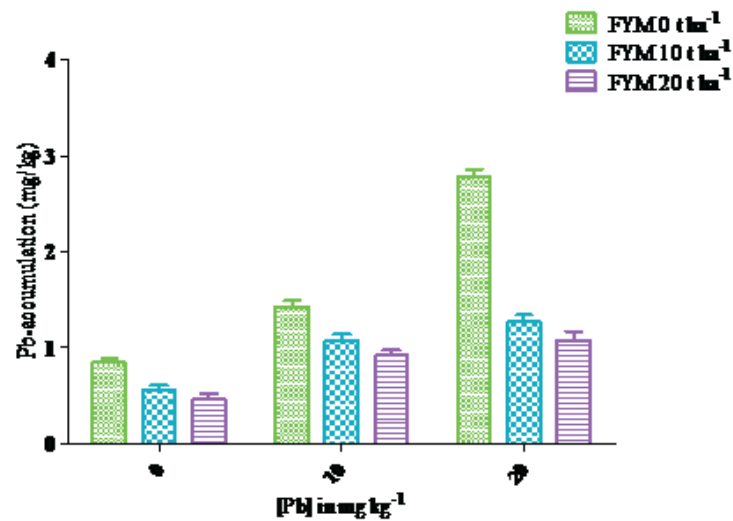
S.E. = 0.06

**ANOVA TABLE**

C.D. = 0.12

Source of Variation	D.F.	S.S.	M.S.S.	Variation Ratio	F-Table	
					5%	1%
Replication	2	0.04	0.02	3.77	3.63	6.23
SS due to SSP	2	4.82	2.41	504.33**	3.63	6.23
SS due to BP	2	0.21	0.11	22.08**	3.63	6.23
SS due to SSP × BP	4	3.85	0.96	201.55**	3.01	4.77
Error	16	0.08	0.00			

\*\*Significant at 1% level of significance

**Fig. 1 f: Effect of Pb × FYM interaction on Pb concentration in root of Coriander (mg kg<sup>-1</sup>)**



The application of 20 mg kg<sup>-1</sup> registered the highest accumulation of Pb (2.84 mg kg<sup>-1</sup> and 2.78 mg kg<sup>-1</sup> in shoot and root, respectively) in Coriander (Fig. 1e & 1.f). The study further indicated that the toxicity of Pb in combined application of FYM 20 t ha<sup>-1</sup> along with varying doses of Pb (0, 10 and 20 mg kg<sup>-1</sup>) decreased significantly. Application of Pb 20 mg kg<sup>-1</sup> + 20 t ha<sup>-1</sup> FYM (T<sub>9</sub>) increases the accumulation of Pb 1.27 fold (mean 1.08 mg kg<sup>-1</sup>) and 1.42 fold (mean 1.27 mg kg<sup>-1</sup>) in the root and shoot of plants, over the control, respectively (fig. 3.e & 3.f). Almost similar findings have been reported by Warman et al., (1995) and Mani et al., (2012a).

## CONCLUSIONS

FYM treated plots registered the highest shoot dry biomass yield of coriander by 28.29 % over the control. Added single doses of Pb 10 mg kg<sup>-1</sup> (T<sub>4</sub>) and 20 mg kg<sup>-1</sup> (T<sub>7</sub>) individually reduced the dry biomass of Coriander by 4.39 % and 12.81 % over the control, respectively. The addition of combined treatment Pb 10 mg kg<sup>-1</sup> + FYM 10 t ha<sup>-1</sup> and Pb 20 mg kg<sup>-1</sup> + FYM 10 t ha<sup>-1</sup> individually increased the dry biomass yield of Coriander by 6.17 % and 7.71 % over the control, respectively. The effect of Pb, FYM and interaction of Pb × FYM on lead accumulation by shoot and root both parts of plants. Application of 20 mg kg<sup>-1</sup> Pb (T<sub>7</sub>) drastically promoted the accumulation of Pb by almost 3.19-3.27 folds in shoot and root over the control, respectively. The application of 20 mg kg<sup>-1</sup> registered the highest accumulation of Pb (2.84 mg kg<sup>-1</sup> and 2.78 mg kg<sup>-1</sup> in shoot and root, respectively) in Coriander (Fig. 1e & 1.f). The study further indicated that the toxicity of Pb in combined application of FYM 20 t ha<sup>-1</sup> along with varying doses of Pb (0, 10 and 20 mg kg<sup>-1</sup>)

decreased significantly. Application of Pb 20 mg kg<sup>-1</sup> + 20 t ha<sup>-1</sup> FYM (T<sub>9</sub>) increases the accumulation of Pb 1.27 fold (mean 1.08 mg kg<sup>-1</sup>) and 1.42 fold (mean 1.27 mg kg<sup>-1</sup>) in the root and shoot of plants, over the control, respectively.

The Pb was reduced observed in FYM treated plots. An ameliorative effect of FYM was observed in Pb-contaminated soil. The results of presented study showed that FYM can effectively immobilize Pb in the soil. FYM has potential to reduce Pb accumulation in both root and shoot of the *Coriander*. The application of FYM to the soil possibly reduces Pb in the edible parts of the plants and helps to reduce the risk to the health of people living in metal contaminated areas. A more detailed study is required to grow *Coriander* or other vegetable crops in metals- contaminated areas and evaluate their growth and distribution of heavy metals in different edible parts of plants. In view of the uncertainties that remain about the behavior and effects of Pb in the food chain, it is desirable to minimize its concentration in crops that are grown on sewage- irrigated soils.

## ACKNOWLEDGEMENT

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## **TRIAL ON THE GENOTYPIC CORRELATION COEFFICIENT IN GUAVA CROP (*Psidium guajava* .L)**

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### **ABSTRACT**

The investigation was carried out at Department of Horticulture, KAPG College Allahabad (U.P.). The five year old plants of 14 varieties (V<sub>1</sub>-V<sub>14</sub>) were taken for the study. The RBD design was used with three replications. Twelve distinguishable characters were taken for study. Theoretically, Guava being self pollinated crop, it has narrow genetic base which limits selection and genetic improvement for the desired characters. Genotypic correlation coefficient clearly depicts the extent of correlation among the characters studied, which further provide the path for improvement. The size of flower had a positive correlation with diameter of fruit, weight of fruit, days required to fruit maturity, number of seeds per plant and Total Soluble Solids during both the year of experiment. Fruit length had positive correlation with number of seeds per fruit, TSS, Total Sugar and reducing and non reducing sugar, size of flower has positive and significant correlation with no. of seeds per fruit. Length of fruit revealed positive and significant correlation with total sugar content and reducing sugar. Diameter of fruit had positive correlation with weight of fruit and days required to fruit maturity. Similarly number of seeds per fruit and TSS

**exhibited positive correlation with all other characters.**

**Keywords :** Guava, genotype, coefficient, correlation.

Guava, the miracle of waste land with inbuilt hardiness has immense potential to exploitation for the welfare of human beings. Being nutritionally rich it is rightly called the apple of tropics. It is a self pollinated crop with narrow genetic base. It is well acclimatized in tropical and sub-tropical parts of our country, especially Allahabad–Kanpur belt. This pocket has several strains needs to identify, compare, selection, improvement and proliferation to the commercialization. Correlation coefficient measures the degree of mutual relationship between two or more variables and it is also essential for improvement in quality as produce of the crop. In case of two or more desirable characters showing positive correlation the selections for one character would automatically help selecting another correlated character. On the other hand, if two or more characters are positively associated and one of them is desirable for breaking such association intensive crossing program has to be launched. Once correlation among the characters analyzed the further improvement may get impetus for the welfare of our rural masses engaged in the cultivation. Keeping these aspects in view, the



experiment was undertaken to ascertain the genotypic correlation coefficient among the characters in guava crop.

## MATERIALS AND METHODS

The investigation was carried out at the Department of Horticulture, KAPG College Allahabad (U.P.). The design applied was RBD with three replications. Five year old plants of fourteen varieties i.e.  $V_1$ - $V_{14}$  (Four -  $V_1$ - $V_4$ , commercial cultivars of the area i.e. Allahabad Safeda, L-49, Apple colour and Red Flashed Guava, (Four- $V_5$ - $V_8$ , selections and Six - $V_9$ - $V_{14}$ , cultures were selected. The site of crop was Allahabad Gangetic region (river bed area). Twelve prominent distinguishable characters i.e. size of flower, pollen grain size, length of fruit, diameter of fruit, weight of fruit, days required to fruit maturity, number of seeds per fruit, TSS content, Acidity content, Total sugar content, Reducing sugar and Non-reducing sugar content were studied. The correlation coefficient was worked out with the method given Al-Jibouri *et al.* 1958.

## RESULTS AND DISCUSSION

All the twelve characters were critically analysed and correlation coefficient was worked on. The data clearly showed (Table 1) that the size of flower has significant positive correlation with diameter of fruit (0.148), weight of fruit (0.132), days required to fruit maturity (0.214), no. of seeds per fruit (0.470) and TSS (0.019), while it showed negative correlation with pollen grain size, Acidity content, Reducing, Non-reducing and Total sugar content. Pollen grain size has positive correlation with fruit diameter (0.108), fruit weight (0.243) and rest characters found to have

negative correlation.

Length of fruit + showed positive correlation with number of seeds / fruit (0.248), TSS (0.539), Reducing (0.199), Non-reducing (0.211) and Total sugar content (0.452). Diameter of fruit showed positive correlation with weight of fruit (0.886) and days required to fruit maturity (0.899). Weight of fruit had positive correlation with number of seeds per fruit (0.184).

Total sugar has positive correlation with reducing sugar (0.728) & Non-reducing sugar content (0.408). TSS had positive correlation with acidity content. These findings are in the conformity with the findings of Johnson *et al.* (1955), Kumar *et al.* (2004), Mukharjee and Dutta (1967), Shanker *et al.* (1967) & Shikhamani *et al.* (1986).

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**Table 1: Genotypic Correlation Coefficient for 12 characters  
(Pooled Data of 2009-10 & 2011-12)**

S.No.	Characters	Size of flower	Pollen grain size	Fruit length	Fruit Diameter	Wt. of Fruit	Days required from fruit maturity	No. of seeds/ fruit	Total soluble solids	Acidity content	Total sugar content	Reducing sugar content	Non reducing
1	Size of flower	1.000											
2	Pollen grain size	-0.200	1.000										
3	Fruit length	-0.095	-0.096	1.000									
4	Fruit Diameter	0.148	0.108	-0.098	1.000								
5	Wt.of Fruit	0.132	0.243	-0.175	0.886	1.000							
6	Days required from fruit maturity	0.214	-0.023	-0.264	0.899	0.803	1.000						
7	No. of seeds/ fruit	0.470	-0.741	0.248	0.260	0.184	0.498	1.000					
8	Total soluble solids	0.019	-0.458	0.539	-0.219	-0.395	-0.292	-0.008	1.000				
9	Acidity content	-0.377	-0.547	-0.070	-0.196	-0.243	-0.183	0.268	0.258	1.000			
10	Total sugar content	-0.163	0.104	0.452	-0.453	-0.570	-0.720	-0.438	0.221	-0.036	1.000		
11	Reducing sugar content	-0.581	-0.016	0.199	-0.567	-0.592	-0.665	-0.251	0.120	0.324	0.728	1.000	
12	Non reducing	-0.256	-0.040	0.211	-0.664	-0.721	-0.793	-0.513	0.522	0.017	0.408	0.357	1.000

## HAEMATOLOGICAL PROFILE OF *CHANNA PUNCTATUS* (BLOCH) EXPOSED TO ATRAZINE (HERBICIDE)

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### ABSTRACT

The present investigation includes haematological responses such as TEC, Hb, TLC, PCV, MCV, MCH and MCHC levels after 15, 30 and 45 days of post-treatment. The haematological parameters such as TEC, Hb and PCV values were decrease in all the intervals. The TLC and MCV values increase significantly after the dose of treatment in all the cases. The MCH value increase after 15 and 30 days, except 45 days this value was observed to be decrease. The MCHC value decrease after 15 and 45 days of PT except 30 days this value was observed to be slightly increased.

The treated fish show restlessness and reflecting respiration. The haematological manifestation of the treated fish *Channa punctatus* is suggestive of anemia.

**Key word:** *Channa punctatus*, atrazine, TEC, Hb, TLC, PCV, MCV, MCH, MCHC, anemia.

Fish can serve as bio-indicators of environmental pollution and can play significant roles in assessing potential risk associated with contamination in aquatic environment since they are directly exposed to chemicals resulting from agricultural production via surface run-off or indirectly through food chain of ecosystem. Some

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fungicide (eg, copper sulphate , thirum, chlorothalonil and capton ) especially toxic effect on fish (Pimental, 1971, Lorgue et al. 1996, Tomlin, 2000) and bees (Hartley and Kidd, 1983). Fungicides frequently used around the home constitute a major hazards to pets and livestock due to accident, carelessness or deliberate misuse (Osweiler et al. 1985, Gupta and agrawal 2007, Oruc et al 2009).

The toxicant enter into fish body affects their metabolism leading to the physiological, pathological and biochemical disorders (Karuppasamy, 2000; David *et al.*, 2003; Singh. 2004; Mohammed and Kahtani, 2011; Desai and Parikh 2012). Ayoola (2008) has reported that water pollution by pesticides is a serious problem to all aquatic fauna and flora and to a considerable extent even man (Christensen and Tucker 1976).

Atrazine affect the physiological and biochemical functions such as growth, development, reproduction and circulatory system in the fish. The circulatory system is greatly affected by the water quality and external environmental factors (Weigand *et al.*, 2001; Elia *et al.* 2002; Selim 2003; Scrubner *et al.* 2005; Battaglin *et al.* 2008; Campo *et al.*, 2008; Langiano and Martinez 2008). Nawani *et al.* (2010) studies the effect of atrazine on lipid peroxidation and activities of antioxidant

enzymes in the fresh water fish *Channa punctatus* (Bloch).

## MATERIALS AND METHODS

### Blood sample

Fresh blood sample was obtained from the fish specimens of fish *Channa punctatus* by a sharp cut near the caudal end. Blood sample collected for the haematological purpose, was kept in glass vials taking all necessary care to prevent haemolysis and clotting by using anticoagulant. Estimation of TEC, Hb, TLC, PCV, was done by haemoglobinometer, haematocrit tube and haemocytometer. Values of MCV, MCH and MCHC was calculated values. These values depends on the value of Hb, TEC and PCV.

### Statistical analysis

Data on haematological values were

statistically calculated by using 't' test and analysis of variance.

## RESULTS AND DISCUSSION

The data on the haematological values of *Channa punctatus* both untreated and treated with atrazine are presented in table and fig. the observation are the following :

A significant decrease in TEC counts from 2.35Cu/mm<sup>3</sup> 2.41Cu/mm<sup>3</sup> 2.37 Cu/mm<sup>3</sup> after 15 30 and 45 days of post-treatment these value of untreated fish were 3.30 Cu/mm<sup>3</sup>, 3.03 Cu/mm<sup>3</sup> and 2.70 Cu/mm<sup>3</sup> after 15 ,30, 45 days(Fig.1).

A significant decrease in haemoglobin content from 11.02 mg/dl, 11.05 mg/dl and 8.52mg/dl after 15,30,45 days PT respectively. These values of untreated fish were 12.54mg/dl, 11.82mg/dl and 10.75mg/dl after 15, 30 and 45 days (Fig.2).

**Table: Haematological parameters in blood of *Channa punctatus* treated with Atrazine**

Parameters	15 Days		30 Days		45 Days	
	Control	Treated	Control	Treated	Control	Treated
TEC (million/mm <sup>3</sup> )	3.30 ±0.3000	2.35 ±0.3306	3.03 ±0.2500	2.41 ±0.2027	2.70 ±0.1274	2.37 ±0.2001
Hb(mg/dl)	12.54 ±0.6013	11.01 ±0.1404	11.82 ±0.7111	11.05 ±0.0410	10.75 ±0.7052	8.52 ±0.3123
TLC (million /mm <sup>3</sup> )	3230 ±130.000	3600 ±50.0000	3120 ±110.323	3730 ±100.000	3330 ±50.0000	3620 ±25.2355
PCV (Percentage)	40.10 ±1.1011	36.64 ±1.1710	39.72 ±0.7157	35.50 ±0.3000	32.45 ±0.3552	27.80 ±1.0000
MCV (fl)	112.46 ±0.6667	143.21 ±7.4441	122.67 ±2.1623	136.66 ±1.5012	107.10 ±2.1000	112.10 ±1.5100
MCH (pg)	36.23 ±1.0137	43.10 ±2.6004	36.76 ±0.3742	39.01 ±0.3562	37.47 ±1.1503	32.3 ±1.6006
MCHC(%)	31.56 ±1.0131 ±0.3717	30.11 ±1.0002 ±0.3553	30.07 ±1.7700 ±1.1270	31.47 ±1.6772 ±1.09745	33.35 ±1.4036 ±0.7165	30.15 ±2.4101 ±1.3051

Results are mean ± S.E. (n=3)

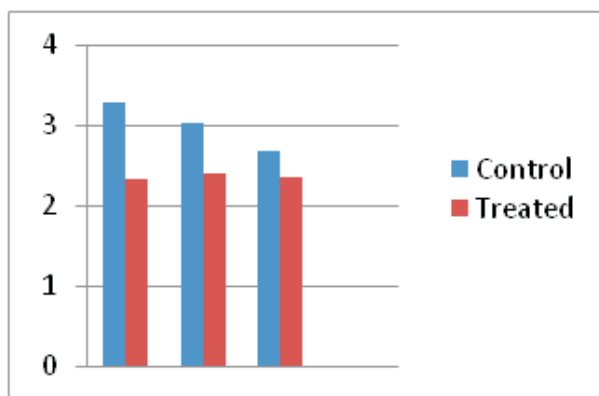


Fig. 1. Total Erythrocyte Count

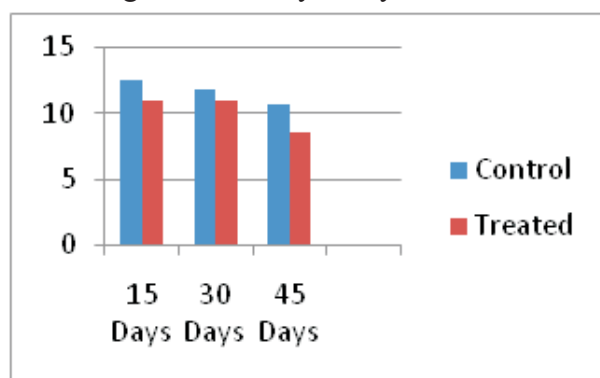


Fig. 2. Haemoglobin Concentration

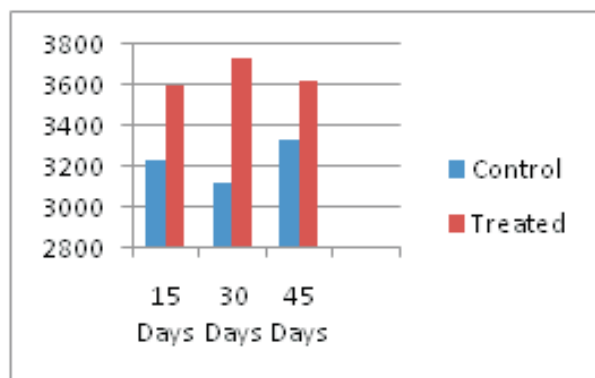


Fig. 3. Total Leukocyte Count

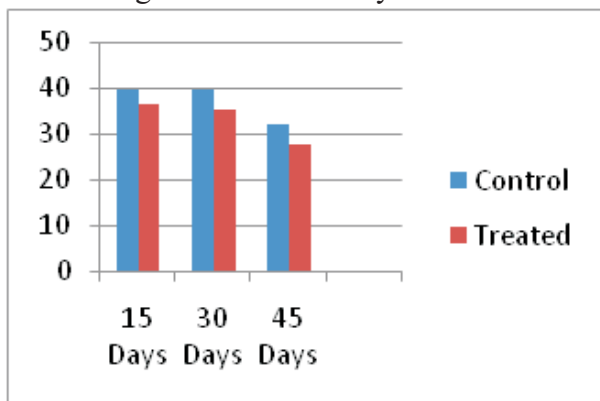


Fig.4. Packed Cell Volume

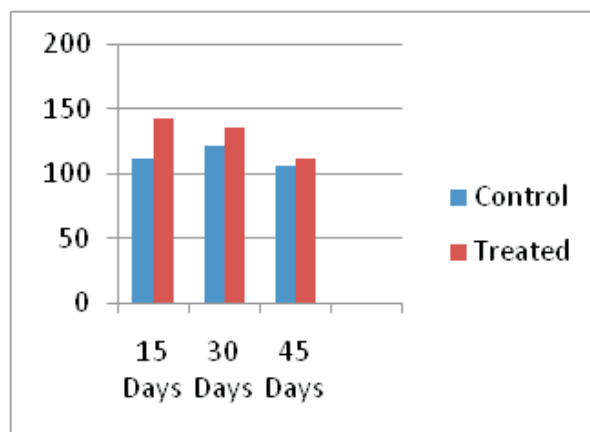


Fig. 5. Mean Corpuscular Volume

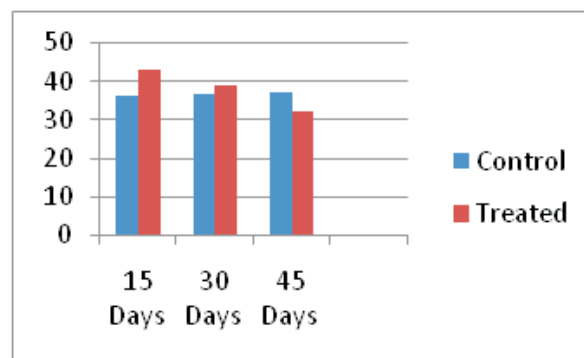


Fig. 6. Mean Corpuscular Haemoglobin

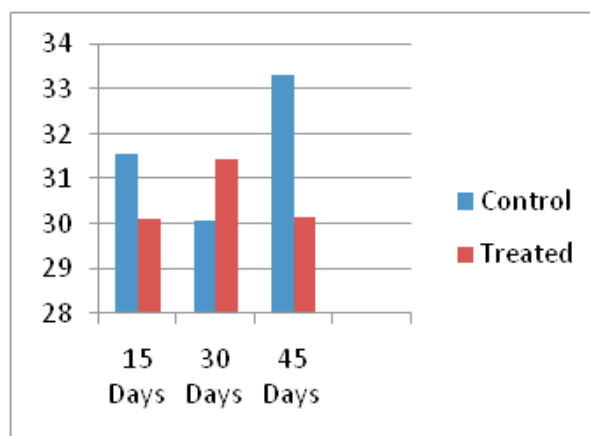


Fig. 7. Mean Corpuscular Haemoglobin Concentration



A significant increase in TLC counts from 3600 Cu/mm<sup>3</sup>, 3730 Cu/mm<sup>3</sup> and 3620 Cu/mm<sup>3</sup> after 15, 30 and 45 days of post-treatment these value of untreated fish were 3230 Cu/mm<sup>3</sup>, 3120 Cu/mm<sup>3</sup> and 3330 Cu/mm<sup>3</sup> after 15, 30, 45 days (Fig.3).

A significant decrease in PCV from 36.64, 35.50 and 27.80 percent after 15, 30 and 45 days of post-treatment these value of untreated fish were 40.10, 39.72 and 32.45 percent after 15, 30 and 45 days (Fig.4).

A significant increase in MCV from 143.2 fl, 136.66 fl 112.10 fl after 15, 30 and 45 days of post-treatment these value of untreated fish were 112.46 fl, 122.67 fl and 107.10 fl after 15, 30, 45 days (Fig.5).

A significant increase in MCH from 43.10 pg and 39.01 pg after 15 and 30 days except 45 days of post-treatment this value decrease at the dose level of 32.3 pg. These value of untreated fish were 36.23 pg, 36.76 pg and 37.47 pg after 15, 30, 45 days (Fig.6).

A significant decrease in MCHC from 30.11%, 30.15% after 15 and 45 days except 30 days of post-treatment this value increase at the dose level of 31.47%. These value of untreated fish were 31.56%, 30.07% and 33.35% after 15, 30, 45 days (Fig.7).

The toxicity of atrazine in fish *Channa punctatus* produced marked alteration in the haematological constituents. The alteration varied with the duration of toxicity. The present experimentation clearly shows significant decrease in TEC, Hb and PCV in a majority of result in all the intervals of post-treatment of atrazine. The anemic condition was observed

after 15 days of post-treatment and progressed with time. Anemia is the reduction in the total mass of haemoglobin bearing erythrocyte with resultant deficiency in oxygen transport. An anemia is due to abnormal blood cell loss which cannot be compensated sufficient by normal erythropoiesis or to decrease blood cell production which fails to allow sufficient replacement of red blood cells which are lost normally.

The toxicity of chlorpyrifos has been observed on erythrocyte sedimentation rate (ESR) (mm h<sup>-1</sup>) in fish, *Channa punctatus* (Malla et al. 2009). An increase in ESR (mmh<sup>-1</sup>) has been reported in *Clarias batracus* after exposure to savin (Kumar and Banerjee, 1990).

Ramesh et al. (2009) studied the terminal effects of the toxin atrazine on common carp (*Cyprinus carpio*) blood indices and understood that the studied blood parameter levels were affected significantly by the toxic effects of the toxin atrazine.

Hanke and Gluth (1985) indicated that the species of carp placed in the proximity of 100 µg/L concentration of atrazine for 72 hours showed significant reduction in plasma concentrations in their blood which is due to the dilution effect in the blood of the fish group.

The results show that the toxicity of atrazine for *C. punctatus* is both time and concentration dependent, thus, accounting for differences in LC<sub>10-90</sub> values obtained at different concentrations and time of exposure.

We noticed that there was a significant increase in MCV and MCH value. The MCHC value slightly decrease inspite of the decrease

TEC, Hb, and PCV value this result could suggest that the anemia was observed in the fishes within the normal healthy range. Similar finding has been observed by Sharma and Singh(2007), Ololade and Oginni (2009), Mahananda et al (2014).

Long term exposure of organisms to pesticides or herbicides means a continuous health hazard for the population. So, human population is at high risk by consuming these toxicated fishes. Protection against their effects needs sensitive markers of exposure.

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## PHYSICO-CHEMICAL STUDY OF GROUND AND MUNICIPAL WATER OF NEWAI TEHSIL, DISTRICT- TONK, (RAJASTHAN), INDIA

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### ABSTRACT

**This paper show the physico-chemical study of ground & municipal water of outer region (Newai) of Tonk district. Three different ground water samples from Newai Bazar (NB), Newai Morah (NM.), Banasthali Railway-crossing(BR) and one municipal water sample from Banasthali village (B.V.) during Jan 2013-June 2013 and analysed. The values obtained were compared with standards prescribed by WHO & ISI1050091. In the present study three water samples were within the limit. One water sample showed high T.D.S., TH, Cl, TA, F and low DO values indicating poor water quality, The significance of the results is further discussed.**

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

Water well knows universal solvents & it is essential for the survival of all living being. Industrial 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 & 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 the possible impact of the ground water quality.

In Tonk Ground water occurs mostly under phreatic conditions. In alluvial areas, ground water generally occurs under water table conditions where as in hard rock and crystalline rocks, it is under slight pressure. The weathered zone below the water table acts good storage for ground water. The movement of ground water is controlled by the weathered zone, joints, fissures, fractures, bedding planes and other structurally weak zones in hard rock and grain size distribution in alluvium. The movement is further controlled by the extent, size, openness, continuity and interconnection of fractures. Quaternary Alluvium, Phyllites Schist, and Granitic- gneisses are the major hydrogeological formation in the district .

### Study Area:

Tonk district of Rajasthan is situated on National Highway No. 12 at distance of 100 km from Jaipur. It is located in northeastern part of the state between 75.19' & 76.16 East longitudes and 25.41' and 26.24' North Latitude. The total area of the district is 7194 km<sup>2</sup>. Newai is major tehsil of Tonk district. Newai Bazar (NB), Newai Moarh (NM.)

Banasthali Railway crossing (RC) and one municipal water sample from Banasthali village (B.V.) are region of Newai Tahasil of Tonk District. The people are using ground water as

well as municipal water for daily needs. The present investigation was carried out by selecting four different sites from Newai Tehsil.

**Table 1 : Sampling points and places**

Sl. No.	Samplings Points	Type of water sources
1.	Newai Bazar (N.B.)	Ground water
2.	Newai More (NM)	Ground water
3.	Banasthathli Railway- crossing (B.R.)	Ground water
4.	Banasthathli Village (B.V)	Municipal water

## MATERIALS AND METHODS

Water samples were collected from four sampling points of different locality of Allahabad city during periods of six months Jan 2013-June 2013. The sampling points & places were given in Table-1.

Water samples were collected in plastic canes of 3 liter capacity as per standard procedure, Electrical Conductivity (E.C.), Total Dissolved Solids (T.D.S.), Turbidity, Dissolve Oxygen (D.O.), Total Alkalinity (T.A.), Total Hardness (T.H.), Calcium ( $\text{Ca}^{++}$ ), Magnesium ( $\text{Mg}^{++}$ ), Sodium ( $\text{Na}^{+}$ ), Potassium ( $\text{K}^{+}$ ), Chloride ( $\text{Cl}^{-}$ ), Sulphate ( $\text{SO}_4^{--}$ ), Nitrate ( $\text{NO}_3^{-}$ ) were determined using standard method by Patil et. al., (2001), Purandara et. al., (2003) and Srinivasa & 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 physico chemical parameters during Jan 2011-June 2011 are presented in Table-2. The pH is a measure of the

intensity of 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 6.1 to 7.6 and were within limit prescribed by WHO.

Electrical conductivity (E.C.) value signifies the amount of total dissolved salts. An EC value varies from 600 to 2531  $\mu\text{mho/cm}$  which reveals that EC values for all samples were in the prescribed limit. The EC value for sample D (600) 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 600 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 200 to 1100 mg/l. It shows that sample A have higher value than the prescribed limit given by ISI 10500-91. The



highest TDS value in sample A may be due to sewage pond near the sampling points. Sample C&D have lower values than the prescribed limit ISI 1050091.

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 makes the water unfit for domestic purposes, food & beverages industries and many other industrial uses. In the present study the turbidity values vary between 4.5 to 8.4 NTU and were within the limit prescribed by ISI 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 3.2 to 8.0. 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 a 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 (620, 618 & 610 mg/l) was found to be greater than the values prescribed by W.H.O.

Hardness of water mainly depends upon the amount of calcium or magnesium salts or both. Hardness of water is objectionable regarding water use for laundry & domestic purpose, since it consumes a large quantity of soap. In the present study total hardness value varies from 268 to 955 mg/l. The values for A, B, C & D samples were higher than the

prescribed limit.

The amount of calcium varies from 29.00 to 120.0 mg/l. and the magnesium content is in the range between 28.30 to 185.0 mg/l. which is found within the prescribed limit except sample D below prescribed limit and sample A above prescribed limit. Sodium (Na<sup>+</sup>) concentration varies between 18.0 to 72.0 mg/l. Potassium concentration varies from 0.71 to 3.9 mg/l in which no standard values are suggested for drinking by WHO & ISI 10500-91.

Chloride imparts salty taste if present in excess (>250 mg/l). People who take too high chloride in water are subjected to laxative effect (Trivedi and Goel, 1986). Chloride presence in study area ranges from 89.40 to 450.0 mg/l. Only the sample 'D' was found within prescribed limit. The sulphate content varies between 39.83 to 92.00 mg/l and the nitrate content varies between 0.038 to 0.158 mg/l. The sulphate & nitrate values were found within the prescribed limit. In all samples values of fluoride are so high (5.0, 4.0, 4.5 & 3.0 mg/l) than the prescribed limit (1.0-2.0 mg/l) of WHO.

## Conclusion

Deviation is shown by hand pump water from municipal drinking water and 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 & Kaur (1999), Manivaskam (2005) and Suman & Sharma (2010).

**Table-2 : Average Value of Physico- chemical parameters of drinking water with standard parameter (Jan 2013 to June 2013)**

Sl. No.	Parameters	Sampling Points				WHO 1993		ISO 10500-91	
		A	B	C	D	Min	Max		
1	PH	6.1	6.4	7.1	7.6	6.7	7.7	6.5	8.5
2	EC	2622	1690	1630	600	466	2914	1400	-
3	T.D.S.	1100	600	500	200	160	1080	1000	500
4	Turbidity	6.8	8.4	4.5	4.9	3.8	8.6	-	-
5	DO	3.2	6.0	7.3	8.0	2.7	8.2	-	-
6	TA	620	618	610	180	140	614	120	200
7	TH	955	683	601	268	168	923	500	300
8	Ca <sup>++</sup>	120.0	100.0	90.00	29.01	25.65	117.8	100	75
9	Mg <sup>++</sup>	185.00	80.00	70.11	28.30	25.34	153.2	150	30
10	Na <sup>+</sup>	66	54	72	18	15	73	200	200
11	K <sup>+</sup>	0.71	0.76	2.90	3.80	0.6	3.4	-	-
12	Cl <sup>+</sup>	390	450	300	89.40	69.02	477.5	250	250
13	so ?	92.00	50.20	60.40	39.83	39.73	93.39	250	200
14	NO ?	0.158	0.095	0.081	0.038	0.035	0.158	45	45
15	F <sup>+</sup>	6.0	4.0	4.5	3.0	1.0	2.0	-	-

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## STUDY ON KNOWLEDGE OF DAIRY HUSBANDRY AMONG TRIBAL WOMEN MEMBERS OF DAIRY COOPERATIVES IN DANGS

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### ABSTRACT

**Present study was conducted in Dangs , a tribal district of Gujarat state to study knowledge level of women milk producers regarding Dairy Husbandry practices. Total 252 women respondents, member of Dairy cooperatives were interviewed. Most of the participants are BPL (78.97%), illiterate (40.08) and lowly educated (59.92%), between the age group of 31 to 50 years ( 63.10%) comprising of 100% SC / ST . Most of the respondents (98.02%) opined that crossbred cows produce more milk in comparison to Desi cows and buffaloes. All (100%) respondents are aware for Vaccination, De-worming and Mineral Mixture feeding. Awareness level for Dairy husbandry practices among women milk producers is more than 90% for five critical practices like providing more than three times drinking water (96.03%), feeding balanced cattle feed (99.21%), Green fodder feeding (98.80%), Grooming (97.61) and Daily washing (99.21),**

**Key words:** Cross bred, balance cattle feed, grooming, vaccination, de-worming.

Milk production from existing milch animals is dependent broadly on feeding,

management and preventive health and hygiene practices adopted by dairy farmer. Judicious use of inputs and adoption of good management practices at farm level will improve milk production and profit of dairy farmer and will make dairying sustainable business . Providing adequate water, balance feed, feed additives along with preventive care like De-worming, vaccination and by adopting good livestock management practices milk production can be easily boosted.

An adequate supply of drinking water to dairy cattle is important for milk production. Typically farmers make free access of quality drinking water twenty four hours. An average 41 litres water is required per day for dry cows and 115 litres per day for milking cows ( Adams, et.al., 1995 and Mc Farland, D.F.1998).

Garg (2012) suggested that milk production efficiency in dairy animals can be improved through balanced feeding. There is considerable scope for the enhancement of milk production with the existing feed and animal resources.

Verma,et. al.(2009) observed that milk production and fat% in lactating buffaloes both significantly increased after feeding feed

supplement containing Protein and mineral mixture.

Gadberry and Powel (2014) suggested that milk production can be improved by implementing successful de-worming programme, along with overall good herd management.

Immunizations are an integral part of an effective health programme. Vaccinations help to curtail the emergence of disease and limit its spread from animal to animal, Suttmeier (2003).

Sehukken and Douglas (2010) found that Grooming has positive impact on milk production in 2<sup>nd</sup> lactation cows and reduces occurrence of mastitis in lactating animals.

## **MATERIALS AND METHODS**

### **(i) Information on Area of Study:**

Dangs is one of the smallest district of Gujarat state, has three talukas and 311 villages. Ahwa is district head quarter. Dangs is surrounded by Maharashtra state from East and south, Surat District in North and Navsari District in west. The terrain is hilly. The climate is dry in winter till March and thereafter humidity increases. The monsoon lasts till October. The soil quality is very poor and unsuitable for agriculture.

Most of the residents are tribals (94%). Agriculture is very poor and habitants can not sustain their living on it, hence are dependent on labour work for livelihood. They migrate for labour job to near by towns, cities and villages and work in Sugar Industry, construction work, and on farms as unskilled worker to earn their livelihood. Now, they are adopting dairy husbandry as a profession for livelihood with formation of Dairy cooperatives.

### **2: Sample Selection:**

1-Stratified random sampling technique is applied to select 15 village dairy cooperatives out of total 150 village dairy cooperatives functioning in Dangs as on 31-03-2012.

2- 252 respondents were selected randomly from 15 village dairy cooperatives out of total 734 members. Care has been taken that respondents should be in the range of 30% to 40% of total membership from each village dairy cooperative (an average 34%).

### **3-DATA COLLECTION AND PROCESS:**

With purpose to collect primary data from milk producers, schedule was prepared and used. Pilot testing of schedule was done with another group of milk producers of same area to know the comprehensibility of schedule. Suggestions obtained during pilot testing were accepted and schedule was finalized accordingly. Schedules were filled by investigator at door step of women member.

### **4-ANALYSIS:**

For analysis purpose, data collected were arranged, tabulated and analyzed to give appropriate information. Unnecessary data were removed from analysis. To understand analysis and tables descriptive statistics is used.

## **RESULTS AND DISCUSSION**

1. Participants are comprised of Schedule tribe and scheduled caste (100%), mostly (63.10%) between the age of 31 to 50 years are BPL (78.97%), illiterate (40.08) and lowly educated (59.92%).
2. 98.02% respondents perceive that cross bred cows produce more milk in comparison to Desi cows and Buffaloes.

2. Respondents understand importance of providing drinking water and 96.03% respondents provide three and more than three times water to cross bred cows.
3. 99.21% respondents understand the importance of feeding balanced cattle feed to animals. 69.44% respondents provide right quantity of balanced cattle feed for milk production, 89.69% for maintenance, 82.94% for pregnancy and 89.68% to heifers.
4. Awareness level for De worming is 100% and 81.74% respondents replied that two time de worming should be done during the year.
5. Awareness level for Vaccination is 100%, Green fodder feeding 98.80%, mineral Mixture feeding 100%, Grooming 97.61%, Daily Washing 99.21% and need for well ventilated, clean, dry and leveled cattle shed is 98.80%.

**Table.1 Demographic profile and general information of respondents.**

Particulars	I	II	III	IV
Age No.s / %	<30 72 / 28.57	31-40 101 / 40.08	41-50 58 / 23.02	>51 21 / 8.33
Category/Caste No.s / %	BPL 199 / 78.97	APL 53/21.03	ST 247 / 98.02	SC 5/1.98
Land Acres No.s / %	Nil 12 / 4.76	Up to 2 80 / 31.75	2.1 -4.0 99 / 39.28	>4.1 61 / 24.21
Education No.s / %	Illiterate 101 / 40.08	Primary 102/40.48	High school 49/19.44	Graduate 0/0
Marital Status No.s / %	Married 239 / 94.84	Unmarried 4/ 1.59	Divorce 1 / 0.4	Widow 8 / 3.17

**Table 2. Showing Awareness level of respondents regarding productivity of animals.**

Milk production is more in		
Type of Animal	Nos.	Percentage
Desi Cow	-	-
Cross Bred	247	98.02
Buffalo	5	1.98
<b>Total</b>	<b>252</b>	<b>100%</b>



**Table 3. Showing Awareness level of respondents regarding requirement of drinking water to cross bred cows**

<b>No. of times water is required</b>	<b>Nos.</b>	<b>Percentage</b>
Do not know	1	0.40
Once	-	-
Twice	9	3.57
Three times & more	242	96.03
<b>Total</b>	<b>252</b>	<b>100%</b>

**Table 4. Showing awareness level of respondents regarding requirement of balanced cattle feed for milk production to cross bred cows**

<b>Cattle feed is required</b>	<b>Nos.</b>	<b>Percentage</b>
Half the Quantity of milk production	175	69.44
Equal to Quantity of milk production	39	15.48
More than quantity of milk production	18	7.14
Do not know	20	7.94
<b>Total</b>	<b>252</b>	<b>100%</b>

**Table 5. Showing awareness level of respondents regarding requirement of balance cattle feed for maintenance of cross bred cows.**

<b>Balance Cattle feed should be given to cross bred cows as maintenance ration</b>		
<b>Opinion</b>	<b>Nos.</b>	<b>Percentage</b>
1.Yes	250	99.21
2.No	2	0.79
<b>Total</b>	<b>252</b>	<b>100%</b>
<b>Quantity of balance cattle feed needed as a maintenance ration</b>		
<b>Maintenance ration</b>	<b>Nos.</b>	<b>Percentage</b>
1 To 2 Kg./Day	226	89.69
3 Kg./Day	5	1.98
More than 3 Kg./Day	-	-
Do not know	21	8.33
<b>Total</b>	<b>252</b>	<b>100%</b>

**Table 6. Showing awareness level of respondents regarding requirement of balance cattle feed for pregnant cross bred cows.**

<b>Balance Cattle feed should be fed to pregnant cows.</b>		
<b>Opinion</b>	<b>Nos.</b>	<b>Percentage</b>
1.Yes	250	99.21
2.No	2	0.79
<b>Quantity of cattle feed fed to pregnant cross bred cow</b>		
1 to 2 Kg./Day	209	82.94
3 Kg./Day	24	9.52
More than 3 Kg./Day	6	2.38
Do not know	13	5.16
<b>Total</b>	<b>252</b>	<b>100%</b>

Table 7. Showing awareness level of respondents regarding requirement of balance cattle feed for rearing cross bred heifers.

<b>Balance Cattle feed should be fed to Heifers.</b>		
<b>Opinion</b>	<b>Nos.</b>	<b>Percentage</b>
1. Yes	252	100
2. No	-	-
<b>Total</b>	<b>252</b>	<b>100%</b>
<b>Quantity of balance cattle feed required for heifers</b>		
<b>Quantity of Cattle feed</b>	<b>Nos.</b>	<b>Percentage</b>
1 to 2 Kg./Day	226	89.68
3 Kg./Day	5	1.98
More than 3 Kg./Day	-	-
Do not know	21	8.34
<b>Total</b>	<b>252</b>	<b>100%</b>

Table 8. Showing awareness level of respondents regarding need and frequency of de-worming.

<b>De-worming is required.</b>		
<b>Opinion</b>	<b>Nos.</b>	<b>Percentage</b>
1. Yes	252	100
2. No	-	-
<b>Total</b>	<b>252</b>	<b>100%</b>
<b>Frequency of de-worming during the year</b>		
<b>No. of times</b>	<b>Nos.</b>	<b>Percentage</b>
1 time	15	5.95
2 time	206	81.74
3 time	21	8.34
Do not know	10	3.97
<b>Total</b>	<b>252</b>	<b>100%</b>

**Table 9 showing awareness level of respondents regarding dairy husbandry practices**

Particulars	Yes (%)	No (%)	Total
Vaccination is required	252 (100)	0 (0)	252 (100)
Green fodder should be available to Cross bred cows	249(98.80)	3(1.20)	252(100)
Mineral mixture is necessary for animals	252(100)	0(0)	252(100)
Grooming is required	246(97.61)	6(2.39)	252(100)
Daily washing of animal is necessary	250(99.21)	2(0.79)	252(100)
Cattle shed should be airy, dry , clean and well leveled	249(98.80)	3(1.20)	252(100)

## CONCLUSION

Study shows that most of the tribal women who are member of Dairy cooperatives had knowledge needed for dairy husbandry profession.

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## **STUDIES OF PERSONAL PROFILE AND ADOPTION LEVEL OF DASP TRAINEES IN RELATION TO BIODYNAMIC PRACTICES IN CHILLI CROP IN ALLAHABAD DISTRICT.**

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### **ABSTRACT**

**The survey was conducted in Allahabad (U.P.) covering six blocks, six villages and sixty respondents with a view to ascertain the personal profile of respondents and adoption level of Biodynamic Package of Practices (B.P.P.) by trainees under DASP programme implemented in the Department of Horticulture at K.A.P.G. College, Allahabad during 20010-11.**

**The Study inferred that majority of the respondents were of middle age group, School level educated, Middle income group with High mass media exposure. The component of B.P.P. technology such as harvesting, seed sowing, land preparation and seed treatment were found to be adopted by the majority of the respondents. However, the components such as irrigation, fertilization and crop protection were poorly adopted by them which need intensive training in ordered to develop the skill among the participants.**

**Key Words:** Adoption, DASP, trainees, personal Profile,

Diversification of agriculture enterprises, innovations, Indigenous

Technological Knowledge (ITKs), farm machinery and crucial inputs has become imperative in limited unit of land for not only quality produce and profit optimization but also for employment, sustainability, eco-friendly and holistic development. To achieve such a pilot goal the policy makers, administrators, scientist and even farmers have realized for agriculture diversification. In his regard, training is very potent tool to conceptualize and impart knowledge and transfer skill to the trainees.

Indiscriminate use of chemicals caused alarming situation in the field of health, food, cloth and biosphere. We have rich wealth of I.T.Ks. for quality and yield improvement without any kind of deterioration. Rishi-Krishi, Homa-Farming, Biodynamic and Organic Farming are the few examples of such type of I.T.Ks.

Ascertaining Profiles is an important approach to draw definite conclusions about the participants. Characters like, age, education, income, size of land holding, social participation, and mass media exposure are critical predictors influencing the skill development and technology adoption.

Adoption of B.P.P. at field level is very



complex phenomenon which governs by several obvious and hidden factors. Despite similar training package adoption variabilities are observed in field situation.

In view of above facts, it was felt imperative to examine the adoption of biodynamic package of practices in Chilli crop at farmer's field.

## **MATERIALS AND METHODS**

Allahabad District was selected purposively because of the potential vegetable growers available in that area. Investigation had covered all the six block in the district with ten farmers from each block which were actively engaged in vegetable production.

For the selection of the respondent a list of progressive farmers from each block was prepared by the U.P. Government, Department of Horticulture and Food Processing of the District, after selection the list of trainees was sent to the DASP, (Horticulture Unit), Lucknow from where they were ordered to undergo for training on Biodynamic Horticulture at K.A.P.G. College, Allahabad. Total sixty farmers were trained on specialized subject. For the analysis of personal profile the data were collected through the personal interview method. The data related to adoption of B. P.P. were collected with the help of interview schedule. The collected data were analysed with the use of simple statistical tools and conclusion were drawn.

## **RESULTS AND DISCUSSION**

### **Personal Profile of the Respondents:**

Personal Profile included as Age, Education, Income, Land Holding Size, Social Participation and Mass Media Exposure in the

study.

As revealed from the Table 1, majority of the trainees (75.00%) were of middle age group followed by young age (16.67%) and 8.33% old age. In education point of view 61.67% had school level, 16.67% each primary and graduate level and only 5.00% were found to be illiterate. Majority of trainees were of medium income (50%) group followed by 25% each of low and higher income group. Fifty percent were found to have small land holding size followed by medium, (31.67%) and large (18.33%). Very poor social participation was observed and 45% were found in that any membership whereas 30% were having one organization membership and 15% with more than two organization memberships but only 01.00% was found to be office bearer. In relation to mass media exposure 38.33% were medium level followed by low 33.33% and 38.33% high. The findings are in the conformity with the findings of Patel and Thakkar (1991), Kokate (1980), Mishra (1994) and Rathour (2000).

### **ADOPTION OF B.P.P.**

#### **The analysed data are given in Table-2**

It is evident from the Table-2 that majority of the trainees (78.10%) adopted the B.P.P. in Chilli crop were of middle age group followed by young (44.30%), and old age group (37.80%); an average 69.28%, adopted one or more practices and rest (30%), were not found to be adopters of any B.D. practice in Chilli cultivation. In education, over whelming majority of trainees 79.51% adopted is of school level, followed by graduation and above (57.10%), primary to middle (54.20%) and only

33.33% illiterate. Adoption percentage 83.80 was greater with medium income group followed by higher income group (71.43%) and least (31.25%) with low income group. Trainees with small land holding size have had higher adoption (75.23%), followed by medium (68.89%), and large (51.91%). Role of social participation in adoption found to be ineffective

and 78.81% adopters had no social linkage while 73.81% adopters were found to be office bearer and 61.11% were associated with one organization and 54.00% had linkage with more than one organization. Mass media exposure yielded greater adoptability and 70.59%, adopters were of high exposure of mass media followed by medium (69.57%) and 67.85% low.

**TABLE-1 PERSONAL PROFILE OF B.P.P. TRAINEES**

<b>Age Composition in Years</b>	<b>Frequency</b>	<b>Percentage</b>
(a) Yong (up to 30 years)	10	16.67
(b) Middle (above 30 years and up to 50 years)	45	75.00
(c) Old (above 50 years)	5	8.33
<b>Total</b>	<b>60</b>	<b>100</b>
<b>Educational Qualification</b>		
(a) Illiterate	3	5.00
(b) Primary to middle	10	16.67
(c) School level	37	61.67
(d) Graduate and above	10	16.67
<b>Total</b>	<b>60</b>	<b>100</b>
<b>Annual Income in Rupees</b>		
(a) Low (up to Rs. 30,000)	16	25
(b) Medium (more than Rs. 30,000 and up to Rs. 60,000)	30	50
(c) High (more than Rs. 60,000)	14	25
<b>Total</b>	<b>60</b>	<b>100</b>
<b>Land Holding Size</b>		
(a) Small (up to 1.0 ha)	30	50
(b) Medium (>1.0 to 2.0 ha)	19	31.67
(c) Large (>2.0 ha)	11	18.33
<b>Total</b>	<b>60</b>	<b>100</b>
<b>Social Participation</b>		
(a) No membership	27	45.00
(b) Member of one organization	18	30.00
(c) Member of More than one organization	9	15.00
(d) office bearer	6	1.00
<b>Total</b>	<b>60</b>	<b>100</b>
<b>Mass Media Exposure</b>		
(a) Low (up to 25)	20	33.33
(b) Medium (> 25 to 50)	23	38.33
(c) High (> 50)	17	28.33
<b>Total</b>	<b>60</b>	<b>100</b>

TABLE-2 ADOPTION OF B.P.P.

Personal Profile	Land Preparation	Seed Treatment	Seed Sowing	Fertilization	Irrigation	Crop protection	Harvesting	Total Mean
Age Composition in Years	Fr., %	Fr., %	Fr., %	Fr., %	Fr., %	Fr., %	Fr., %	Fr., %
(a) Yong (up to 30 years)	7 (70.00)	6 (60.00)	4 (40.00)	3 (30.00)	4 (40.00)	2 (20.00)	5 (50.00)	4.43 (44.30)
(b) Middle (above 30 years and up to 50 years)	39 (86.67)	35 (77.78)	43 (95.55)	27 (60.00)	33 (73.33)	25 (55.55)	44 (97.78)	35.14 (78.10)
(c) Old (above 50 years)	2 (40.00)	2 (40.00)	3 (60.00)	1 (20.00)	1 (20.00)	1 (20.00)	3 (60.00)	1.89 (37.80)
<b>Total</b>	<b>48 (80.00)</b>	<b>44 (73.33)</b>	<b>50 (83.33)</b>	<b>31 (50.10)</b>	<b>38 (63.33)</b>	<b>28 (46.00)</b>	<b>52 (86.67)</b>	<b>41.57 (69.29)</b>
Educational Qualification								
(a) Illiterate	2 (66.67)	1 (33.33)	2 (66.67)	0 (00.00)	0 (00.00)	0 (00.00)	2 (66.67)	1 (33.33)
(b) Primary to middle	8 (80.00)	5 (50.00)	7 (70.00)	3 (30.00)	4 (40.00)	3 (30.00)	8 (80.00)	5.42 (54.20)
(c) School level	31 (83.78)	38 (83.78)	34 (91.89)	25 (67.57)	28 (75.68)	22 (59.46)	35 (94.59)	29.42 (79.51)
(d) Graduate and above	7 (70.00)	7 (70.00)	7 (70.00)	3 (30.00)	6 (60.00)	3 (30.00)	7 (70.00)	5.71 (57.10)
<b>Total</b>	<b>48 (80.00)</b>	<b>44 (73.33)</b>	<b>50 (83.33)</b>	<b>31 (50.10)</b>	<b>38 (63.33)</b>	<b>28 (46.00)</b>	<b>52 (86.67)</b>	<b>41.57 (69.29)</b>
Annual Income in Rs.								
(a) Low (up to Rs. 30,000)	8 (50.00)	6 (37.50)	10 (62.50)	3 (18.75)	4 (25.00)	2 (12.00)	12 (75.00)	5 (31.25)
(b) Medium (more than Rs. 30,000 and up to Rs. 60,000)	26 (93.33)	26 (86.67)	30 (100)	21 (70.00)	22 (73.33)	21 (70.00)	28 (93.33)	25.14 (83.80)
(c) High (more than 60,000)	12 (85.71)	12 (85.71)	10 (71.43)	7 (50.00)	12 (85.71)	5 (35.71)	12 (85.71)	10 (71.43)
<b>Total</b>	<b>48 (80.00)</b>	<b>44 (73.33)</b>	<b>50 (83.33)</b>	<b>31 (50.10)</b>	<b>38 (63.33)</b>	<b>28 (46.00)</b>	<b>52 (86.67)</b>	<b>41.57 (69.29)</b>
Land Holding Size in ha								
(a) Small (up to 1.0 ha)	27 (90.00)	24 (80.00)	28 (93.33)	17 (56.67)	20 (66.67)	14 (46.67)	28 (93.33)	25.57 (75.23)
(b) Medium (>1.0 to 2.0 ha)	15 (78.95)	14 (73.68)	16 (84.21)	9 (47.37)	13 (68.42)	10 (52.63)	16 (84.21)	13.28 (68.89)
(c) Large (> 2.0 ha)	6 (54.55)	6 (54.55)	6 (54.55)	5 (45.45)	5 (45.45)	4 (36.36)	8 (84.2)	5.71 (51.91)
<b>Total</b>	<b>48 (80.00)</b>	<b>44 (73.33)</b>	<b>50 (83.33)</b>	<b>31 (50.10)</b>	<b>38 (63.33)</b>	<b>28 (46.00)</b>	<b>52 (86.67)</b>	<b>41.57 (69.29)</b>
Social Participation								
(a) No membership	23 (85.19)	23 (85.19)	24 (88.89)	19 (70.37)	20 (74.07)	16 (59.26)	24 (88.89)	21.28 (78.81)
(b) Up to one organization	12 (66.67)	11 (61.11)	40 (77.78)	7 (38.89)	10 (55.56)	8 (44.44)	50 (83.33)	11.00 (61.11)
(c) Member of more than one organization	6 (66.67)	5 (55.56)	7 (77.78)	3 (33.33)	4 (44.44)	2 (22.22)	7 (77.78)	4.86 (54.00)
(d) office bearer	6 (100.00)	5 (83.33)	5 (83.33)	3 (50.00)	4 (66.67)	2 (33.33)	6 (100.00)	4.43 (73.81)
<b>Total</b>	<b>48 (80.00)</b>	<b>44 (73.33)</b>	<b>50 (83.33)</b>	<b>31 (50.10)</b>	<b>38 (63.33)</b>	<b>28 (46.00)</b>	<b>52 (86.67)</b>	<b>41.57 (69.29)</b>
Mass Media Exposure								
(a) Low (up to 25)	17 (85.00)	15 (75.00)	16 (80.00)	9 (45.00)	12 (60.00)	9 (45.00)	17 (85.00)	13.57 (67.89)
(b) Medium (> 25 to 50)	19 (82.61)	18 (78.26)	19 (82.61)	12 (52.17)	13 (56.52)	11 (47.83)	20 (86.96)	16.00 (69.57)
(c) High (> 50)	12 (70.59)	11 (64.71)	15 (88.24)	10 (58.82)	13 (66.47)	8 (47.06)	15 (88.24)	12.0 (70.59)
<b>Total</b>	<b>48 (80.00)</b>	<b>44 (73.33)</b>	<b>50 (83.33)</b>	<b>31 (50.10)</b>	<b>38 (63.33)</b>	<b>28 (46.00)</b>	<b>52 (86.67)</b>	<b>41.57 (69.29)</b>

These findings are supported with the findings of Choudhary et. al. (1988) Singh & Singh (1990), Reddy et. al. (1982) and Kokate (1980)

Majority of trainees were of middle age group (75.00%) with medium income group (50.00%) and school level education (61.67%). They had small land holding size (50.00%), with poor social participation (45.00%) and having medium mass media exposure (38.33%). Illiterate (5.00%) and old age

(8.33%) participant number was least, which indicates that our farming community structure had changed as compared to those of early days. Socio-economic status was also found to medium in nature which is some what static in position as compared to past one. Personal profile such as age, education, income, land holding size and mass media exposure had influenced the level of adoption of B.P.P. significantly.

## CONCLUSION

It can be concluded that D.A.S.P. training was found to be significantly effective in adoption of B.D.P.P. in Chilli crop and personal profiles of the participants too had affected the adoption of B.D.P.P. significantly.

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**AGRO-ECOLOGICAL ZONE AND CROP COMBINATION IN BALLIA DISTRICT, U. P.****Sanjay Kumar Tripathi**

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*Received : 10.06.2014**Accepted : 15.07.2014***ABSTRACT**

**The agricultural sustainability can never be achieved only by traditional technique of forming. Eco friendly technological constituents, such as mechanical, chemical, biological, energy input and irrigation are the base of agricultural development. Judicious and conscious uses of these constituents are very necessary otherwise they may lead the whole rural system in unsustainable condition. Sustainable agriculture requires a shift in approach to eco friendly technology generation process and also its dissemination. The existing research paper deals AgroEcological Zones in Mirzapur district has been examined in the present discussion taking under following categories: (i) Khader (Ghaghara), (ii) Khader (Gangatic), (iii) Bhangar, (iv) Margins of old and new alluvium, and (v) Diara. To explain the crop combination region in the existing paper, Weaver's method has been adopted and found to be quit satisfactory.**

**Key Words :** Agro ecological, environment crop.

Ecology is generally defined as the study of plants or animals in reciprocal relation to their environment or external world. The

agro-ecology is the study of agriculture and its relationship with environment. So, the delimitation or identification of zones according to agriculture – environment relationship, called as agro-ecological zones. The knowledge of physical environment in relation to crop will enable not only the evolving of a suitable cropping pattern but also the modification of various agronomic practices for sustainable, eco-friendly and better output. The identification of various agro-ecological zones is a pre-requisite for the sustainable agriculture and growth in crop production. A number of scholars and organizations have attempted to work on the same problem (Smith, 1972; Abunoori, 1992). National Bureau of Soil Survey and Land Use Planning (NBSS & LUP), Nagpur has identified such zones for the country as a whole.

The distributional patterns of crop have developed crop predominance area which has given rise to different crop combination units (Singh, 1970). The crops are generally grown in combinations and it is rarely that a particular crop occupies a position of total isolation than other crops in a given areal unit at a given point of time (Husain, 1996). For a comprehensive and clear understanding of the agricultural mosaic, agricultural regionalization and planning, the combination analysis of crops becomes necessary. Crop combinations are formed due to the physico-socio-cultural



environments prevailing in an area.

The Ballia district lies between 25° 33' N to 26° 11' N latitude and 83° 38' E to 84° 39' E longitude (NATMO, 1995). The district is situated in the eastern part of the Uttar Pradesh and bordering Bihar. The district represents a typical triangular shaped 'Doab' of the two great rivers, Ganga and Ghaghara rivers, the Ganga in the south and the Ghaghara in north. It is characterized mostly by plain land gently sloping (west to east), frequent flood (eastern part) and economically backward district of eastern Uttar Pradesh (Fig. 1).

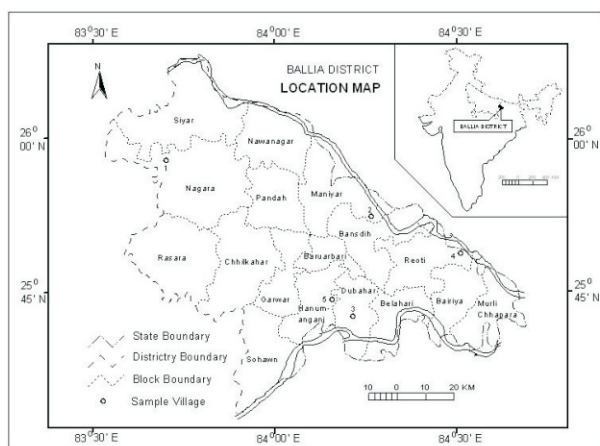


Fig. 1

## INDICATORS, DATA BASE AND CLASSIFICATION

A study of the interaction between the physical environment and agricultural practices is actually a complex problem because of numerous measurable and non-measurable parameters (Abunoori, 1992). In present investigation, the agro-ecological zones in Ballia District have been identified on the basis of physico-environmental clues such as geology, topography, drainage system, soils, land use / land cover, natural vegetation, agricultural land quality, agricultural productivity, etc. The delineation of various

agro-ecological zones is largely based on the remotely sensed data on scale 1:250,000 taking into account of regional characteristics. The classification system has been adopted in the present analysis under following categories: (i) Khader (Ghaghara), (ii) Khader (Gangatic), (iii) Bhangar, (iv) Margins of old and new alluvium, and (v) Diara.

For a more objective grouping of crop combination region, a number of statistical procedures have been introduced in which the Weaver's formula (1954), as given below has been found to be quite satisfactory. His method is known as minimum deviation method which may be expressed as below:

$$SD = \sqrt{\sum d^2 / n} \quad \text{or} \quad SD = \sum d^2 / n$$

Where,

SD = Standard deviation of the crop combination,

D = Difference between the actual crop percentage in an area unit and appropriate percentage in the theoretical curve,

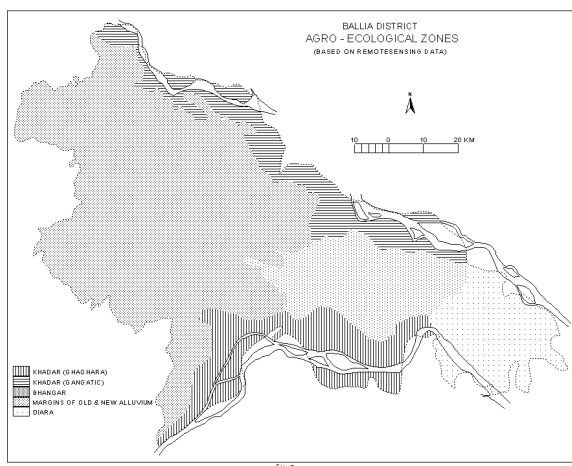
n = Number of crops in a combination.

## RESULTS AND DISCUSSION

### Spatial Pattern and Characteristics of Agro-Ecological Zones

The ecological zone Khadar (Ghaghara) is formed by the deposition of new alluvium sediments carried by stream. This is characterized by predominantly flat topography, abounded paleo-channels. This zone is situated at northern portion of the study area consists in both side of Ghaghara river. On the imagery, this zone is represent bright to dull tones indicating moisture variation from well drained to poorly drained soil and from fine to

coarse texture. This ecological zone is highly suitable for agriculture due to fertile soil, good prospect of water availability and better quality of land. This zone in Siyar, Nawanagar, Maniyar, Bansdih and Reoti blocks, where very good to good production of paddy, wheat and maize (Fig. 2).



The ecological zone Khadar (Gangatic) also formed by the deposition of new alluvium sediments carried by stream. Although, Gangatic Khadar differ from Ghaghara Khader in the view of agricultural practices but of these landform features some similarities in view of underlying materials and process of formation. This zone is situated at southern portion of the study area consists in both side of Ganga river and blocks constitute by Sohawn, Hanumangaj, Dubahar, and Belahari. This is characterized by lowland flat rough topography. Unconsolidated materials like sand, silt and clay from the surface feature. On imagery, this is represented by bright to dull tones indicating moisture variation from well drained to poorly drained soil and from fine to coarse texture.

The ecological zone Bhangar is formed by deposition of old alluvium sediments. This is characterized by flat topography. On imagery,

this zone is represented by dark tone and fine texture. This ecological zone is highly suitable for cultivation fertile soil and better quality of land and canal irrigation. This ecological zone in Siyar, Nagara, Rasara, Chilkahar, Nawanagar, Pandah, Garawar, Sohawn, Hanumanganj, Maniya and Bansdih Blocks constitute a very fertile land where very good to good production of paddy and wheat crops may be noted. Bhangar ecological zone holds more economic significance than others. Black, yellow and sandy soils are the main soil types found in this area.

The ecological zone Margins of old and new alluvium is represent both (bhangar and khadar) type of ecological zone characteristics. This is formed by the deposition of both new and old alluvium sediments. This is characterized by flat topography, although there are some surface irregularities caused by abounded channels. This zone is situated at middle portion of the study area. On imagery, this is represented by mixed tone, texture shape and size.

Diara ecological zone is situated at doab of Ghaghara and Ganga rivers. This zone is formed by deposition of newer alluvium sedimentation. This is characterized by flat rough topography due to revironus action and frequent flood. On imagery, this is represented by mixed tone, texture shape and size.

### Crop Combination

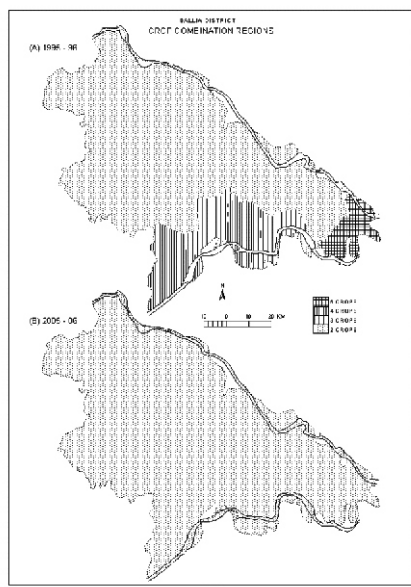
Several geographers have applied Weaver's method in combinational study. Some have followed this method in demarcating the crop and livestock combination (Scoti, 1957; Coppack, 1964) or industry combination (Johnson and Teufner, 1968). Other have shown

its weakness (Rafiullah, 1954; Hoag, 1969) are have used it after suitable modifications (Doi, 1959, 1970; Thomas, 1963; Ahmad and Siddiqui, 1967; Husain, 1976, 1996; Singh, 1977). To explain the crop combination region in Ballia district, Weaver's method has been adopted and found to be quite satisfactory. The

region of the district varies from two to six crops (Fig. 3 and Table - 1) in the combination due to physio-cultural and economic setup of the district

Two crop combination region depicted in 12 blocks in 1995 – 96 namely Siyar (rice – wheat), Nagara (rice – wheat), Rasara (weat – rice), Chilkahar (weat – rice), Nawanagar (rice – wheat), Pandah (rice – wheat), Maniyar (weat – rice), Baruarbari (rice – wheat), Bansdih (weat – rice), Reoti (weat – rice), Garwar (rice – wheat), and Bairiya (wheat – maze). In 2005 – 06 all the blocks have two crop combinations under wheat – rice except two blocks Nawanagar and Pandah have rice – wheat combination.

Only two blocks Hanumanganj (wheat – rice – maze) and Belahari (wheat – gram – maze) registered three crop combinations in 1995 - 96. The two blocks Sohawn (wheat –



**Table – 1 : Crop Combination in Ballia District (1995 – 96 and 2005 – 06)**

No. of Crops in Combination	1995 - 96		2005 - 06	
	No. of Blocks	Name of Blocks	No. of Blocks	Name of Blocks
Monoculture	-	-	-	-
Two	12	Siyar (RW), Nagara (RW), Rasara (WR), Chilkahar (WR), Nawanagar (RW), Pandah (RW), Maniyar (WR), Baruarbari (RW), Bansdih (WR), Reoti (WR), Garawar (RW), Bairiya (WCr).	17	Siyar (WR), Nagara (WR), Rasara (WR), Chilkahar (WR), Nawanagar (RW), Pandah (RW), Maniyar (WR), Baruarbari (WR), Bansdih (WR), Reoti (WR), Garawar (WR), Sohawn (WR), Hanumanganj (WR), Dubahar (WR), Belahari (WR), Bairiya (WR), Murlichhapara (WR).
Three	2	Hanumanganj (WRCr), Belahari (WGCr).	-	-
Four	2	Sohawn (WMSRG), Dubahar (WCrRG)	-	-
Six	1	Murlichhapara (WArCrKoJoBa).	-	-

Note: R = Rice, W = Wheat, Cr = Corn (Maze), G = Gram, Ms = Masoor, Ar = Arhar, Ko = Kodo, Jo = Jowar, Ba = Bajara.

masoor – rice – gram) and Dubahar (wheat – maze – rice – gram) observed under four crop combination region in 1995 – 96. The six crop combination region is observed in Murlichhapara (with wheat, arhar, maze, kodo, jowar, bajara) in 1995 – 96.

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## MOLECULAR CONNECTIVITY OF ORGANOMETALLIC SUBSTRATES AND LIGANDS AS STRUCTURAL UNITS: CORRELATION WITH MOLAR REFRACTION

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### ABSTRACT

Molar connectivity calculations have been carried out for highly anisotropic bidentate ligands having  $C_{2v}$  symmetry and organometallic substrates of the formulae,  $R_2MX_2$ , where R is an alkyl group and X is a halogen atom. Multiple Chi terms  $\chi_t^m$  and  $\chi_t^v$  for hydrogen suppressed graphs with reference to vertex valence,  $\delta_i$  and valence delta, respectively have been correlated with the molar refraction,  $R_m$  by the stepwise multiple regression analysis of the first order. The statistical analysis shows a better correlation with terms indicating that the molar refraction is additive as well as transferable from the bond refraction of a path having molecular connectivity  $^1\chi$  to the total connectivity. These correlations will play an active role in the SAR (Structure Activity Relationships) for ligands, substrates and in turn for highly anisotropic chelates of the formulae,  $R_2ML_x$  where L is an anisotropic bidentate ligand.

**Keywords:** Molecular connectivity, molar refraction, organometallics, valence delta.

Organometallic compounds having high anisotropy have been a matter of interest to chemists for several years. The light scattering studies by bidentate ligands (Saksena, 1977)

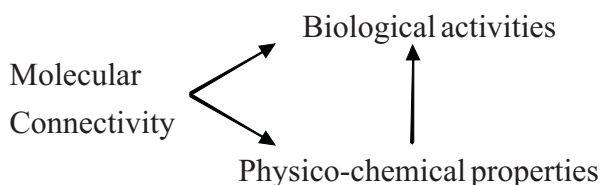
suggest that some ligands can be used as probes in deciding the conformation of chelates of the formulae,  $R_2ML_x$  (where L is an anisotropic bidentate ligand and M is the central metal atom). Many bidentate ligands e.g. 8-hydroxyquinoline (oxine) and salicylic acid (Perrin, 1958) show antibacterial action with many drugs during chelation. Chelates of 2,2'-bipyridyl show marked curariform action during chelation. In designing a chelate of biological importance, organometallic moieties,  $R_2M^{+n}$  play a vital role in relating structure and biological activity. There are many organometallic halides, which retain their cis structure even after co-ordination and act as agonist molecules (Saksena, 1988). and show marked biological activities. Structural and conformational studies based on the principle of additivity and transferability of bond polarisability components of chelate molecules have already been reported earlier (Nelson et.al., 1986).

Structure activity relationships (SAR) these days are of considerable interest to theoretical chemists. This paper deals with a simple concept of molecular connectivity utilizing graph theory. Every skeletal structure (only links connected with a central carbon or a hetero atom) can be correlated with quantities



derived from a topological matrix to a HMO matrix. Physical and biological properties can be correlated with quantities derived from a topological matrix in which non diagonal elements represent atom connectivities or vertex valences,  $\delta_i$  considering a hydrogen suppressed graph of a molecule. Randic (Randic, 1975) devised an index relating to the degree of branching of a hydrocarbon, a topological property subsequently referred to as the connectivity index in correlations of pharmacological actions has been discussed in detail (Kier et.al., 1976).

The relationship (Murray et.al., 1976) between molecular connectivity and physico-chemical properties and biological activities can be shown as follows:



The index,  $\chi$  reflects and additive and constitutive nature of molecules and in some instances can represent the role of the molecular shape and size. The conformation (Kier, 1971) of a molecule provides a specificity with regard to the receptor molecule in the biophase. A particular conformation of a molecule can be adsorbed at a particular site on the receptor molecule (of a tissue, membrane or cell wall) giving rise to optimum biological activity. The site may be predicted by applying MO theories (Kier, 1971) and the distance between the receptor and biologically active molecules can be calculated with the knowledge of

polarizability of the active molecule. The polarizability is directly related to molar refraction  $R_m$ . It is of interest to examine correlations between the graph invariants 1 and sub graph terms e.g.  ${}^m\chi_t$  or  ${}^m\chi_t^v$  depending upon the vertex valence,  $\delta_1$  and valence delta,  $\delta^v$  respectively.

## RESULTS AND DISCUSSION

In its initial formulation Randic's scheme is suited for hydrogen- suppressed graphs of hydrocarbons. The connectivity index between two vertices  $v_i$  &  $v_j$  can be written as,

$$\chi = (\delta_i \cdot \delta_j)^{-1/2} \dots\dots\dots(1)$$

Hence,  $\chi$  is a bond index depending on the local branching in a molecule. The total molecular connectivity is equal to  $\sum \chi$  i.e., sum of all bond connectivity indices. The hydrogen suppressed graphs known as skeletal- structure. These graphs are also labeled with  ${}^1\chi$  terms per bond.

The  ${}^m\chi_t$  terms, the so called higher connectivity indices, can be defined as,

$${}^m\chi_t = \sum_G \prod_i {}^m\pi_i (\delta_i)^{-1/2} \quad (2)$$

where the sum is over connected path subgraphs with 'm' edges, the product is over the vertices constituting subgraphs G, and  $\delta_i$  is the valence of vertex 'i' in a hydrogen suppressed graph. While evaluating  ${}^m\chi_t$  terms, all bonds are considered to be single bonds. The hetero atoms (Saksena et.al, 1986, Brahma et.al, 1986) metallic or non metallic have been retained in the hydrogen- suppressed subgraphs and vertex valences,  $\delta_i$  are calculated in the same way as has been done for a carbon atom in hydrocarbons. This is an extension of the



original concept given by gandic. In evaluating  $^1\chi$  for cyclic molecules, 0.5 is subtracted for each ring. Amidon and Anik (Amidon et.al.,1976) used this modification term in treating hydrocarbon solubility data.

#### Inclusion of Valence delta, $\delta^v$ and $^m\chi_t^v$ terms

One approach of valence delta,  $\delta^v$  has been introduced (Kier et.al.,1976) with the objective to develop valence values for hetero atoms that are non empirical in the sense of formal connectivity and consonant with the

underlying electronic structures of hetero atoms in molecules. Thus,  $\delta_i^v = z^v - h_i$  where  $z^v$  is the number of valence electrons and  $h_i$  is the number of hydrogen atoms suppressed.  $^m\chi_t^v$  terms have been calculated in the same way as  $^m\chi_t$  terms have been evaluated, after labeling vertices by  $\delta_i^v$  instead of  $\delta_i$ . Valence delta for Tl(III) and Sn(IV) have been calculated for the first time. The  $^m\chi_t$  and  $^m\chi_t^v$  terms for the substrates and ligands have been presented in tables 1,2,3 and 4 respectively.

**TABLE – 1 Molar Refraction and  $^m\chi_t$  terms for stepwise multiple regression analysis (Substrates)**

S. No.	Substrates	$R_m \text{ cm}^3 \text{ mol}^{-1}$	1	2	3	3	4	4
*1.	(Et) <sub>2</sub> .SnCl <sub>2</sub>	33.912	3.12	2.87	1.91	2.41	0.25	0.70
**2.	(Et) <sub>2</sub> .SnO	28.552	2.62	1.66	1.21	0.75	0.25	1.00
**3.	(Et) <sub>2</sub> .TlCl	20.888	2.81	1.68	0.99	0.78	0.20	1.65
*4.	(Bu) <sub>2</sub> .SnCl <sub>2</sub>	50.984	5.12	4.37	2.41	2.41	1.43	1.56
**5.	(Bu) <sub>2</sub> .SnO	45.624	4.62	2.87	1.21	0.75	0.63	0.70
*6	(n-Oct) <sub>2</sub> .SnCl <sub>2</sub>	85.128	7.91	6.96	4.31	1.21	2.57	1.21
**7	(n-Oct) <sub>2</sub> .SnO	79.768	8.41	5.70	3.71	0.75	2.21	1.06

\*1.  $R_m$  calc. is determined by the feedback of variables.

\*\*2.  $R_m$  obs. has been taken as  $R_D$  value obtained from the bond refraction additivity, other  $R_m$  values have been evaluated from the experimental data of n.

**TABLE – 2 Molar Refraction and  $^m\chi_t^v$  terms for stepwise multiple regression analysis (Substrates)**

S. No.	Substrates	$R_m \text{ cm}^3 \text{ mol}^{-1}$	1	1	2	3
1.	(Et) <sub>2</sub> .SnCl <sub>2</sub>	33.912	3.12	2.64	1.24	0.52
2.	(Et) <sub>2</sub> .SnO	28.552	2.81	2.45	1.26	0.73
3.	(Et) <sub>2</sub> .TlCl	20.888	2.62	2.53	0.99	0.54
4.	(Bu) <sub>2</sub> .SnCl <sub>2</sub>	50.984	5.12	4.49	2.72	1.26
5.	(Bu) <sub>2</sub> .SnO	45.624	4.62	4.47	2.57	1.41
6.	(n-Oct) <sub>2</sub> .SnCl <sub>2</sub>	85.128	7.91	8.50	5.22	3.43
7.	(n-Oct) <sub>2</sub> .SnO	79.768	8.41	8.32	3.37	3.52

TABLE – 3 Molar Refraction and  ${}^m\chi_t^v$  terms for stepwise multiple regression analysis ( $R_2Sn^{IV}L_2$ )

S. No.	Ligands	$R_m \text{ cm}^3 \text{ mol}^{-1}$	1	2	3	3	4	4
*1.	Dibenzol	63.192	7.73	7.28	4.44	0.54	2.40	1.26
*2.	Tropolone	36.415	3.80	3.42	2.34	0.47	1.52	1.11
**3.	8-hydroxyquino- line	37.483	4.38	4.57	2.17	0.67	2.05	0.96
*4.	salicaldehyde	36.940	4.05	2.96	1.72	0.81	1.01	0.97
*5.	2,2- bipyridine	42.408	3.97	3.62	1.98	0.33	1.28	0.71
**6.	acetylacetone	26.894	3.48	3.48	1.56	0.82	0.62	0.49
*7.	1,10'- phenanthroline	61.050	5.86	4.42	2.46	0.91	1.35	0.59

\*1.  $R_m$  calc. is determined by the feedback of variables.

\*\*2.  $R_m$  obs. has been taken as the  $R_D$  value obtained from the bond refraction additivity and other  $R_m$  values have been evaluated from the experimental data of n.

3. Here, phen = 1,10'-phenonthroline; bpy = 2,2'-bipyridyl.

TABLE – 4 Molar Refraction and  ${}^m\chi_t^v$  terms for stepwise multiple regression analysis ( $R_2Sn^{IV}L_2$ )

S. No.	Ligands	$R_m \text{ cm}^3 \text{ mol}^{-1}$	1	1	2	3
1.	Dibenzol	63.912	7.73	7.77	3.12	1.63
2.	Tropolone	36.415	3.80	3.68	1.26	0.63
3.	8-hydroxyquin-oline	37.483	4.38	4.87	1.95	0.79
4.	salicaldehyde	36.940	4.05	3.71	1.74	0.62
5.	2,2- bipyridine	42.408	3.97	4.27	1.86	0.83
6.	acetylacetone	26.894	3.48	2.88	1.56	0.83
7.	1,10'- phenanthroline	61.050	5.86	6.56	2.32	1.12

TABLE – 5 Best correlations for molar refraction  $R_m$  (Ligands and Substrates)

S. No.	Compounds	Correlations
1.	Ligands	<p>(i) <math>R_m = 15.3921^1\chi + 12.5827^2\chi + 4.4925^3\chi_p - 10.3517^3\chi_c + 11.5675^4\chi_p - 22.0918^4\chi_{pc} + 22.2506</math>  <math>n = 7, r = 1.0000, s = -3.0734e-08, \text{P.E. in } r = -2.2211e-09</math></p> <p>(ii) <math>R_m = 0.8874^1\chi + 8.9888^1\chi^v - 6.7326^2\chi^v + 9.3245</math>  <math>n=7, r = 0.9672, s=0.0323, \text{P.E. in } r = 6.2144e-03</math></p>
2.	Substrates	<p>(i) <math>R_m = 2.0876^1\chi + 2.9550^2\chi + 0.9215^3\chi_p - 1.2547^3\chi_c + 15.4021^4\chi_p - 11.5617^4\chi_{PC} + 27.9445</math>  <math>n=7, r=1.0000, s=-2.5611e-08, \text{P.E. in } r=-1.884e-09</math></p> <p>(ii) <math>R_m = -1.8683^1\chi + 25.5770^1\chi^v - 2.0283^2\chi^v - 27.4387^3\chi_p^v - 13.7703</math>  <math>n=7, r=0.9979, s = 2.3507e-03, \text{P.E. in } r=-3.9232e-04</math></p>

Here; n is number equations, S standard error in  $R_m$  calc., r is correlation coefficient and P.E in r is probable error in correlation coefficient to ascertain the best correlation

### Multiple Regression Analysis

On proceeding for establishing SAR, molar refraction of molecules have been derived alternatively from the refractive indices, n, in solution. In few cases  $R_m$  values have been computed from the bond refraction additivity. Stepwise multiple regression analysis has been carried out on molar refraction and  ${}^m\chi_t$  or  ${}^m\chi_t^v$  terms. In doing statistical analysis,  $R_m$  calc. has been evaluated by the feedback of coefficients of regression and the variables for a molecule.

The correlation coefficient r, standard

error s, and probable error in r have been computed to decide the best correlations between  $R_m$  and  ${}^m\chi_t$  or  ${}^m\chi_t^v$  terms

In the beginning two dimensional concept has been developed leading to basic idea of structure rather than a conformation. Hence, known rigid planar structures have been taken into consideration while evaluating indices. Inclusion of valence delta,  $\delta^v$  improves the quality of a correlation as is demonstrated in table 5. It also appears that the molar refraction depends more on subgraph terms than on  ${}^1$ . Even this concept can be improved if the valence

delta for a hetro atom,  $\delta_N^v$ ,  $\delta_{Ti}^v$  or  $\delta_{Sn}^v$  are also included as an additional variable in the regression analysis.

The ability to predict, Rm from a chemical graph will be significant in SAR for drug molecules. The molar refraction, Rm has already been correlated to a series of local anesthetics. Organotin compounds have been studied recently (Laughlin et al 1984). In the former study parameters such as molar surface areas have been correlated with  $LC_{50}$  values of eight triorganotin compounds. In the latter study  $^1$  and  $^{1v}$  have been used in characterising the toxicities of fifteen organotin compounds. The best correlation has been achieved using  $\log(1/EC_{50})$  values regressed with a single parameter,  $^1\chi^v$ . In latest study topological descriptors (Agarwal et.al., 2009, Murakami et.al, 2003) for a limited edge values have been used besides physical and biological parameters in correlating biological(Saksena et.al. 2009, Singh et.al. 2010, Shaik et.al., 2011, Frieberg et.al, 2005) observed and calculated activities.

It is clear that molecular connectivity terms for subatrates and ligands can be transformed to form subgraph terms of highly anisotropic chelates because these are the potential units for building up the robust chelates.

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## **SYPHONING AND FINALIZATION OF FIELD PROBLEMS IN MONTHLY WORKSHOP UNDER T&V SYSTEM**

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### **ABSTRACT**

**Identification of field problems and their solution on the spot and transfer of unsolved problems to the higher level for further research and solution is the key of T & V system. Monthly workshops plays vital role in solution of finalized field problems and syphoning of unsolved field problems to the research system for further work. The farmers of the study area were well aware of the involvement of Kisan Sahayaks in identification and solution of field problems but their response was not satisfactory regarding the visit of higher level officials . It was observed that the visit of diagnostic team should be increased and their periodicity should be reduced . The forward and backward linkages of monthly workshop should also be strengthened.**

**Key Words:** Monthly workshop, communication.

The training and visit system of agricultural extension aims at building a professional extension service that will be capable of assisting farmers to raising production and to increase income and of providing appropriate support for agricultural development .The system includes certain features like professionalism, a single line of command, concentration of efforts, time bound

work, field and farmers' orientation, regular and continuous training and close linkages with research.

The two days monthly workshop are means of building up the technical skill of SMSs regularly and precisely for the field of their specialization and for the subdivision or district of their jurisdiction. Most of the field problems are also discussed and solved in the monthly workshop but unsolved problems are communicated to the concerned departments and scientists for further research and appropriate solution. It is called syphoning of field problems.

### **MATERIALS AND METHODS**

The study was based on the descriptive diagnostic type of research design. Office bearers and contact farmers were interrogated for identification of field problems. Two blocks namely Kalyanpur and Sarsaul of district Kanpur Nagar were selected for the purpose of investigation with the help of random sampling technique. Six groups of contact farmers were selected and each group of farmer have 10 farmers. Thus the total sample of contact farmers drawn was 60. Four respondents including Add. SDEOs and Kisan Sahayaks were selected from both the blocks for the study Percentage and X<sup>2</sup> test were used as statistical measures for calculation of data.



## RESULTS AND DISCUSSION

Forum of field problems: Organise farm visits and village visits to keep the attention of the people focused on the recommended practices and provide motivation for action to the people. The contact farmers were interviewed on organization of farm visits and village visits by KSs. The data are presented in table -1.

Table 1 reveals that 66.67 per cent contact farmers raise their problems before extension workers in the village, whereas only 33.33 percent contact farmers raise field problems at the farm in block Kalyanpur. In Sarsaul 60.00 per cent contact farmers raise the problems in the village, whereas, 40.00 farmers raise it in field or farm. The average proportion of both the

**Table: 1.Opinion of contact farmers regarding forum of field problems.**

S. No.	Items	Kalyanpur		Sarsaul		Total	
		No of CFs	Per cent	No of CFs	Per cent	No of CFs	Per cent
1.	Village	20	66.67	18	60.00	38	63.33
2.	Farm	10	33.33	12	40.00	22	36.67
	Total	30	100.00	30	100.00	60	100.00
	Value of $X^2$	11.12***		4.0*			

\*\*\* Significant at 0.001 level of probability

\*Significant at 0.05 level of probability

blocks in raising of such problems in the field indicates that 63.33 per cent CFs raise their problems in the village against 36.67 per cent CFs asking such problems in the field. value of  $x^2$  shows that the system had significant impact on the attitude of villagers to raise their problems related to field.

2. Communication of field problems :

communication of field problems in the offices of KSs/Add. SDEO was studied and the results are given in table - 2

It is clear from table -2 that 83.33 per cent contact farmers in block Kalyanpur communicates their field problems occasionally , whereas, 16.67 per cent farmers communicates their field problems in the office

**Table:2. Opinion of contact farmers regarding communication of field problems.**

S. No.	Items	Kalyanpur		Sarsaul		Total	
		No of CFs	Per cent	No of CFs	Per cent	No of CFs	Per cent
1.	Regularly	05	16.67	12	60.00	17	28.33
2.	Occasionally	25	83.33	18	40.00	43	71.67
	Total	30	100.00	30	100.00	60	100.00
	Value of $X^2$	44.43***		4.00*			

\*\*\* Significant at 0.001 level of probability

\*significant at 0.05 level of probability

of KSs. In block Sarsaul 60.00 per cent contact farmers reported that they do not communicate their field problems , while 40.00 per cent reported that they report their field problems to the office of the KSs regularly.

The communication of the field problems in the office of the KSs shows poor infrastructural index in Kalyanpur and better facilities in Sarsaul block. M.N. Reddy and P.G. Reddy (1992) remarked that for developing

messages active participation of farmers, field level workers and scientists is essential.

3. Field visit by supervisory staff: Supervisory staff includes SDEOs, SMSs etc. . The contact farmers were interviewed on field visits of these

officers. The results are given in table -3

It is clear from table -3 that 26.67 per cent contact farmers of Kalyanpur and 46.67 per cent contact farmers of Sarsaul block were aware about the visits of SDEOs/ SMSs.

**Table:3. Opinion of contact farmers regarding the visits of SDEOs/SMSs.**

S. No.	Category	Kalyanpur		Sarsaul		Total	
		No of CFs	Per cent	No of CFs	Per cent	No of CFs	Per cent
1.	Proper visit	08	26.67	14	46.67	22.00	36.67
2.	No visit	22	73.33	16	53.33	38.00	63.33
	Total	30	100.00	30	100.00	60	100.00
	Value of $X^2$	21.77***		0.44			

\*\*\* Significant at 0.001 level of probability

However, in the case of pooled results , the percentage of visits remained lower than no visits (63.33 per cent) by these officers. The results give an idea that most of the contact farmers were unaware about the visits of the SDEOs/SMSs in both the blocks. Value of  $X^2$  shows that there is significant difference in proper visits and no visits of supervisory staff.

4. Visit of diagnostic team: Diagnostic team is supposed to visit the farmers' field once in a crop season. The contact farmers were interviewed regarding visit of diagnostic team. The results are given in table -4.

Table – 4 reflects that 33.33 per cent and 40.00 per cent contact farmers of contact farmers in Kalyanpur and in Sarsaul block were having

**Table: 4. Opinion of contact farmers about field visits of diagnostic team.**

S. No.	Items	Kalyanpur		Sarsaul		Total	
		No of CFs	Per cent	No of CFs	Per cent	No of CFs	Per cent
1.	Proper visits	10	33.33	12	40.00	22	36.67
2.	No visit	20	66.67	18	60.00	38	63.33
	Total	30	100.00	30	100.00	60	100.00
	Value of $X^2$	11.22***		4.00*			

\*\*\* Significant at 0.001 level of probability

\*Significant at 0.05 level of probability

the knowledge about visits of diagnostic team, consisting the scientists of the university and senior officers of DOA. 66.67 per cent and 60.00 per cent contact farmers of blocks Kalyanpur and Sarsaul were unaware about the visit of diagnostic team. Prasad (1988) reported that working of zonal research and extension advisory committees are emerging as the vital point of triangular interaction research, education and extension. The diagnostic team of

the universities and subject matter specialists and extension officials in the monthly workshop are good forums for bringing close cooperation and relationship.

Hence, the diagnostic team is expected to visit the once in a crop season and covers so many aspects like adoption of technologies, performance of demonstrations, reaction of farmers about the crop production recommendations etc.

5. Finalisation of field problems by master trainers in the monthly workshop

Field problems put before the master trainers by the SMSs/Senior officers in the monthly workshop for satisfactory and useful solutions have been studied and the results are presented in table-5

Table- 6 reveals that most of the problems raised by the senior officers/SmSs belonged to Agronomical followed by insect pests and diseases and seed problems. Most of them were solved by the master trainers and 25 per cent problems of insect pests, 16.67 per cent of agronomical and 33.33 per cent of seed were

**Table:5. Problems solved by the master trainers and finalized for further research**

S. No.	Nature of field problems	No. of problems put before master trainers	No. of solved problems	Percentage of prob. solved	No of prob. Finalized for further res.	Percentage of finalized prob.
1.	Insect pest and disease prob.	08	06	75	2	25
2.	Agronomical prob.	06	05	83.33	01	16.67
3.	Seed prob.	03	02	66.67	01	33.33
	Total	17	13	76.47	04	23.53

finalized for research.

6. Syphoning of field problems: A key feature of training and visit system is transfer of the finalized problems to the appropriate departments and scientists by the directors/ chairpersons of monthly workshop. Opinion of master trainers/ scientist regarding siphoning is presented in table – 6.

It is clear from the table that the problems were mostly siphoned by the Director of Extension to the concerned scientists. 25.00 per cent of master trainers/scientists were of the view that the problems were communicated to them by director of Research. Some of the master Trainers/Scientists do receive the field problems but the source of the communication

**Table: 6. Opinion of scientist/master trainers regarding siphoning of field problems**

S. No.	Items	No. of respondents	Percentage
1.	Director of extension	05	62.50
2.	Director of research	02	25.00
3.	Not known	01	12.50
	Total	08	100.00

was not known to them.

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## GEOMORPHOLOGICAL INVESTIGATION USING REMOTESENSING AND GEOGRAPHICAL INFORMATION SYSTEM

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### ABSTRACT

**The existing research paper deals the geomorphological investigation using modern techniques of geoinformatics such as remotesensing (RS) and geographical information system (GIS) taking as case study of Mirzapur District. The district is situated extreme south-eastern part of the state of Uttar Pradesh, comes partly under the Middle Ganga Plain and partly under the Vindhyachal-Baghelkhand region. Geomorphology of the district is so dominant factor in every part of physical and socio-cultural environment. Geomorphological investigation in the Mirzapur district is mostly based on remotely sensed data (IRS-1B, LISS-1, FCC-B2, 3 & 4).**

**Keywords :** Geomorphology, remotesensing, investigation.

Geomorphology is so dominant factor in the human environment that influence on the pattern and destiny of agriculture in Mirzapur district is immense. This is true on macro as well as micro regional scales. The agriculture in mountains, plateaus and plains differs greatly. Similarly, scarps, pediments, valleys, flanks, flood plains, ridges and basins are characterized by different types of agriculture. Micro regional landforms such as

paleo channels, sand bars, flood plain deposits natural levees etc. are marked by different mode of agriculture. The geomorphology sets the foundation and background of agriculture, which can be adopted or can be feasible in a particular area. Geomorphology affects the availability of soil moisture, depth, structure and texture of soil, the amount of solar radiation, the feasibility of terracing, field pattern, agricultural transport, possibilities of irrigation, size of distribution of holdings, continuity of cultivation and the most important aspect of agriculture, i.e. the crops, their nature, yield and out-turn (Ahmad, 1992). Remote sensing and its geomorphologic application have been well explained by Varstappen (1963, 66, 69, 77), Sabins (1987), Barrett and Curtis (1976), Way (1978), Townshend (1981), Curran (1985), Lillesend and Kiefer (1987), Pandey (1998), Mishra and Choubey (1999).

The district of Mirzapur lies between 24° 34' N and 25° 16' N latitude and 82° 05' E and 83° 11' E longitudes (NATMO, 1998). The district is situated extreme south-eastern part of the state of Uttar Pradesh, comes partly under the Middle Ganga Plain and partly under the Vindhyachal-Baghelkhand region (Singh, 1971). The district Varanasi lies to its north-east and east, Sonbhadra district lies to its south-east, Bhadohi (Sant Ravidash nagar)

district in the north-west and district Allahabad in the west and the state of Madhya Pradesh lies to its south-west direction. Mirzapur was a largest district of Uttar Pradesh, but on 1<sup>st</sup> April 1989 a new district named Sonbhadra has been carved out from it. At present the district consist of four tahsils and twelve development blocks. The district, with the maximum length (east-west) of 144.2 km and a maximum width (north-south) of 84 km, covered an area of 4952 km<sup>2</sup>. It is characterized mostly by rugged terrain, frequent flood (north part) and drought hazards and is an economically backward district of eastern Uttar Pradesh.

## MATERIALS AND METHODS

The varying geomorphological investigation in the Mirzapur district is largely based on remotely sensed data (IRS-1B, LISS-1, FCC-B2, 3 & 4) hard copy print on scale 1:250,000. Different geomorphic features of the area have been identified and mapped through visual interpretation taking into account (i) photo elements (colors, tone, texture, shape, size, association, pattern etc.) (ii) geo-technical elements (landforms, geology, soil, vegetation, land use, drainage pattern, etc.) and (iii) convergence of evidence.

## RESULT AND DISCUSSION

The study area may broadly be divided into two geomorphological units: (A) Ganga Flood Plain and (B) Vindhyan Upland. The landform features under Ganga flood plain can be enlisted as: (i) New flood plain, (ii) Old flood plain, (iii) Paleo channel, (iv) Channel bar, and (v) Point bar, and under Vindhyan upland as: (i) Buried pediment, (ii) Pediment with vegetation, (iii) Pediment with stony surface, (iv) Dissected plateau, (v) Denudational hill, and (vi) Valley fill (fig. 1).

### (A) Ganga Flood Plain New Flood Plain

New flood plain known as 'Khader' or newer alluvium is confined to the proximity of Ganga River. It is inundated by flood water annually and received sediment deposition during each flood. On the imagery, this geomorphic unit is characterized by dark red tone, smooth texture, and irregular shape (table 1).

### Old Flood Plain

The vast alluvium tract of the northern part of the area consists of the old or outer flood plain features locally known as 'Bangar' or older alluvium. This geomorphic unit is most important for agricultural part of view and excellence for ground water exploration. It has generally been observed on satellite imagery by light to medium red tones.

### Point Bar, Channel Bar, and Paleochannels

Point bar are formed on the convex side of meanders and grow by individual increments outward into the meander curve (Thornbury, 1969). These point bars have been formed due to the deposition of sediments, carried out river Ganga. The channel bars are formed by the deposition if huge amount of sand in between the channels while paleochannels are formed due to the shifting of courses of river Ganga mostly in the left side (north). Such features (filled with fertile soils) provide very higher yield of crops. The underground water prospect is also very good in these zones.

### (B) Vindhyan Upland Buried Pediment

Buried pediment are those flat surface of the plateau area which have thin to

thick cover of unconsolidated materials mainly gravel, soil (alluvium/ colluvium) or weathered rocks. The buried pediments are very clearly

marked on imagery by red to dark red tones. The buried pediments are marked with good cultivation most suited to rice farming.

**Table 1 - Image Characteristics of Geomorphic Features (Based on IRS-1B, LISS-I, FCC)**

Geomorphic Feature/Unit	Tone	Texture	Shape	Size	Land Use
<b>GANGA FLOOD PLAIN</b>					
New Flood Plain	Dark red	Smooth	Irregular	Large	Very good cultivation
Old Flood Plain	Light to moderate red	Smooth	Irregular	Large	Very good to good cultivation
Alluvial Cone	Medium gray	Coarse	Regular	Small	Moderate cultivation, sandy patches
Channel Bar	Very light	Coarse	Elongated	Small	Sandy patches
Point Bar	Very light	Coarse	Crescentic	Small	None to dry cultivation
<b>VINDHYAN UPLAND</b>					
Buried Pediment	Dark	Coarse	Irregular	Large	Good to very good cultivation, plantation
Pediment with Vegetation	Light to moderate gray	Coarse	Irregular	Large	Open forest, groves, etc.
Pediment with Stony Surface	Light	Coarse	Irregular	Large	Stony west
Dissected Plateau	Gray to medium gray	Uneven mottled	Irregular	Large	Forest
Denudational Hill	Light gray to whitish	Uneven	Irregular	Small	Forest
Valley Fill	Red	Fine	Crescentic	Small	Good cultivation, plantation

### **Pediment**

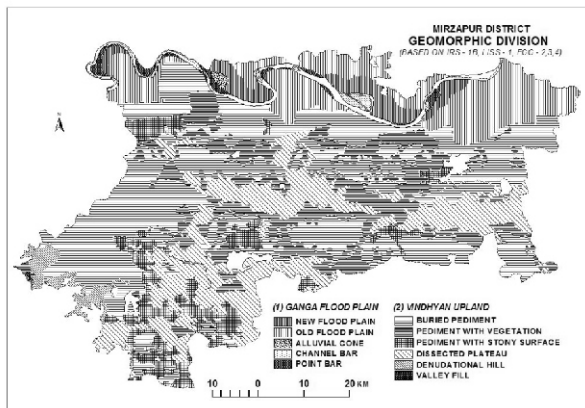
The term pediment is used to designate the open rock surface. Although the processes of pediment formation are complex and naturally involve weathering, rill wash, stream erosion, mass wasting, sheet wash, sheet flood etc. (Ahmad, 1985) but King (1967) considers running water as the chief agent for its formation. These features are mostly surface of flat to very low slop and sometimes, attached with denuded hills. The term pediment has

generally been used for the land forms of arid and semi arid areas to the transitional lands between hills and plain with gently sloping at angles between  $1^{\circ}$  and  $7^{\circ}$ . The pediments in the area under study may be subdivided into two categories: (i) pediments with sparse vegetation, and (ii) pediments having bare rock surfaces. The features under first category are generally visualized by light to moderate gray tones and second by light to very light tones on the imagery.



### Dissected Plateau

The plateau region criss-crossed by various streams is named as dissected plateau. Different features like gorges, valleys, scarp lands etc. are prominent which create undulated topography. This unit is marked on imagery by light to dark gray tones depending on the vegetation covers.



### Denudational Hill

The denudational hills having their flat top surface are found in a chain in the northern flank and south west part of the plateau. These hills are generally enclosed with barren land or rocky surfaces partly buried by debris.

### Valley Fill

The valley fill is the fundamental landform produced by lateral erosion (Tiwari, 1992). This is bed rock erosional surface remains generally unidentified due to being commonly veneered with alluvium.

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## HAEMATOLOGICAL CHANGES IN PRIMARY AND SECONDARY IMMUNE RESPONSES IN EXPERIMENTAL ASCARIDIASIS

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### ABSTRACT

In present studies changes in haematological parameters during primary and secondary immune responses were studied. Experimental design consisted of Group - A for control (non-infected group) and Group - B (B+B1) consisted of chicks for studying immune responses. The control group chicks were dissected on 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup> days and the second Group B, 20 chicks used for primary response were given dose of 250 embryonated eggs and dissected 8 chicks on the 11<sup>th</sup> and 14<sup>th</sup> days. Remaining chicks were used for secondary immune responses. 250 embryonated eggs after 13 days of primary infection were given to B<sub>1</sub> chicks were autopsied on 26<sup>th</sup> and 29<sup>th</sup> days. The Erythrocyte count, haemoglobin and PCV were decreased. The lymphocyte and leucocyte counts were increased in both experimental groups. Monocytes and neutrophils were decreased while eosinophiles and basophiles were increased in all in experimental groups. Immune responses to antigens may be categorised as primary or secondary responses. The primary immune response of the body to antigen occurs on the first occasion it is encountered. Depending on the nature of the antigen and the site of entry this response can take up to 14 days to resolve. In present studies, in comparison primary immune response, the monocytes, basophils,

**neutrophils cells and lymphocytes showed increased value in secondary immune responses.**

**Keywords :** Haematological parameters immune responses, Ascaridiasis

Infection with parasites cause major economic problems world wide in livestock industries. In third world countries helminthiasis in poultry and man causes health hazards. Strong immune responses are generated during parasitic infections. Immune responses are also generated against different stages of parasite, causing tissue reaction at the site of infection (Balic et al 2000). Two kinds of immune responses are induced in the hosts body by any immunogen (1) primary and (2) secondary responses involving humoral and cell mediated or delayed hypersensitivity responses respectively. Ascaridiasis is a disease primarily of young chickens. Ascaridiasis occurs when bird swallows infected eggs of *A. galli*.

The parasitic nematode has gained importance because of their pathology in man and animals. *Ascaridia galli* is common chick parasite (Schrank, 1788). The amount of dietary protein has an effect on establishment of *A. galli* infection in gut of birds kept under the free range condition (Permin et al 1998). Any

pathogen not only cause changes in immune responses but also causes changes in haematological parameters. The immune response addressed in several recent reviews (El- Magawary et al 1998, Mahesh et al 1998, Curca et al 1996, Srisinha 1997, Walkin 1997). Very fragmentary account was encountered regarding studies regarding primary and secondary immune responses. The present study deals with primary and secondary immune responses in experimental ascariasis.

## MATERIALS AND METHODS

**Experimental Host:** Male white leg horn chicks.

**Parasite** - Adult parasites (*Ascaridia galli*) were collected from intestine of infected chicks and parasites were kept for natural egg laying, the pure eggs were cultured and eggs become embryonated within 15-20 days.

**Experimental infection** – Thirty five chicks were divided into two groups Group – A contain 15 chicks which were non infected (control group) chicks and dissected on 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup> and 29<sup>th</sup> days and Group – B contain contains 20 chicks which were given infection dose of 250 embryonated eggs for primary infection and dissected 8 chicks after 11<sup>th</sup> and 14<sup>th</sup> days. Remaining 12 chicks were used for secondary infection of 250 embryonated eggs. The secondary infected group in group – B<sub>1</sub> was dissected to each on 26<sup>th</sup> and 29<sup>th</sup> days.

**Collection of Blood** – Blood was collected from the heart through cardiac puncture.

## RESULT AND DISCUSSION

**All the data are provided in TABLE HAEMATOLOGICAL STUDIES:**

On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days total

Erythrocytes were 6.0 million/mm<sup>3</sup>, 5.8 million/mm<sup>3</sup>, 6.0 million/mm<sup>3</sup>, 5.4 million/mm<sup>3</sup> in group - A (Control group). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it were 5.2 million/mm<sup>3</sup>, 5.7 million/mm<sup>3</sup> and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it were 5.6 million/mm<sup>3</sup>, 4.3 million/mm<sup>3</sup> respectively (significant). (GRAPH – 1)

On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days total leucocytes were 4.6 10<sup>3</sup>/mm<sup>3</sup>, 6.1 10<sup>3</sup>/mm<sup>3</sup>, 5.0 10<sup>3</sup>/mm<sup>3</sup>, 7.7 10<sup>3</sup>/mm<sup>3</sup> in group - A (Control group). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it were 6.25 10<sup>3</sup>/mm<sup>3</sup>, 7.3 10<sup>3</sup>/mm<sup>3</sup> and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it were 8.95 10<sup>3</sup>/mm<sup>3</sup>, 9.0 10<sup>3</sup>/mm<sup>3</sup> respectively ( non - significant). (GRAPH – 2)

On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days the PCV was 34%, 35%, 36%, 32.5% in group – A (control group). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it was 33%, 34.5% and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it was 34%, 25% (significant). (GRAPH – 3)

On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days the Haemoglobin concentration was 11.3%, 11.2%, 12.0%, 10.8% in group – A (control group). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it was 11.0%, 11.4% and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it was 11.3%, 8.3% (significant). (GRAPH – 4)

On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days the Lymphocytes were 49%, 47%, 52%, 47% in group – A (control group). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it were 52%, 50% and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it were 54%, 55% (significant). (GRAPH – 5)

On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days the

Monocytes were 2%, 4%, 3%, 2% in group – A (control group). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it were 1%, 2% and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it were 2%, 1% (non - significant). (GRAPH – 6)

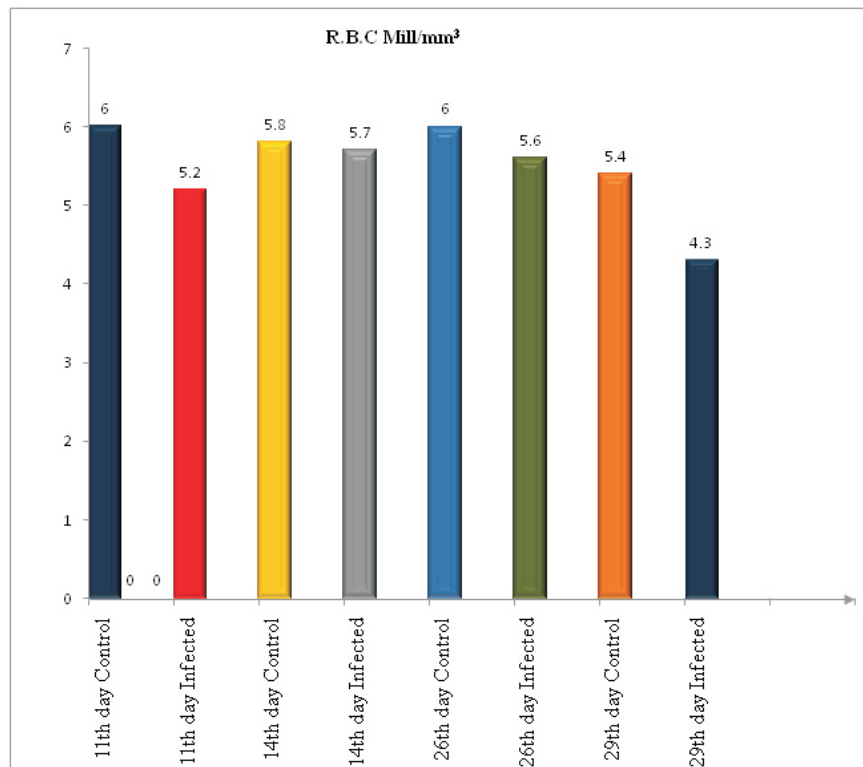
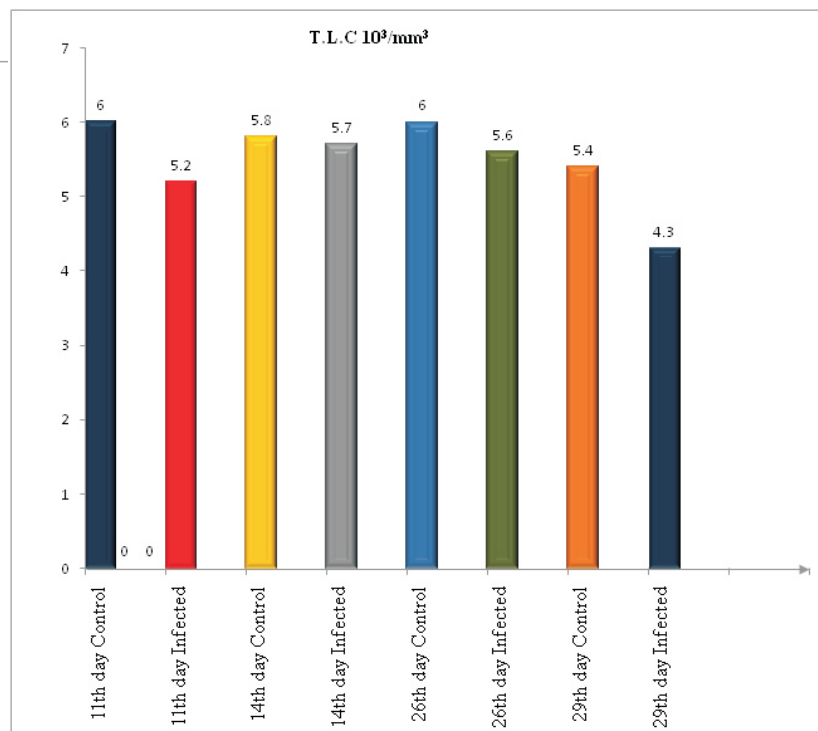
On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days the Eosinophils were 1%, 1%, 1%, 2% in group – A (control group). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it was 2%, 2% and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it was 1%, 3% (non - significant). (GRAPH – 7)

On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days the Neutrophils were 47%, 48%, 48%, 50% in group – A (control group). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it were 46%, 45% and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it were 45%, 43% (non - significant). (GRAPH – 8)

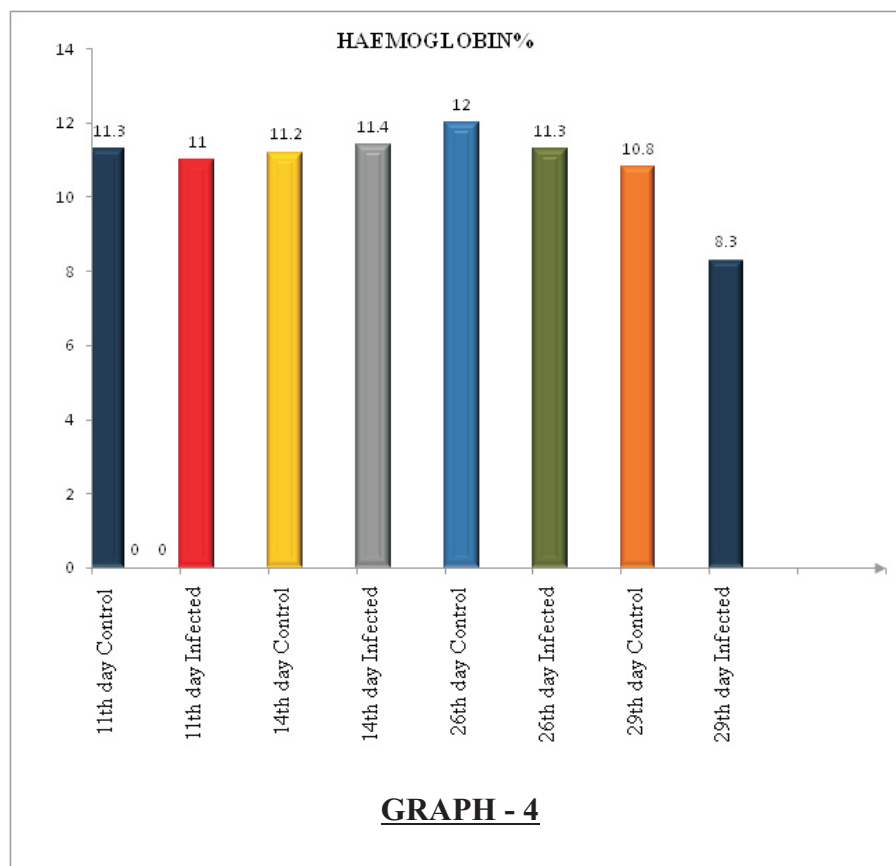
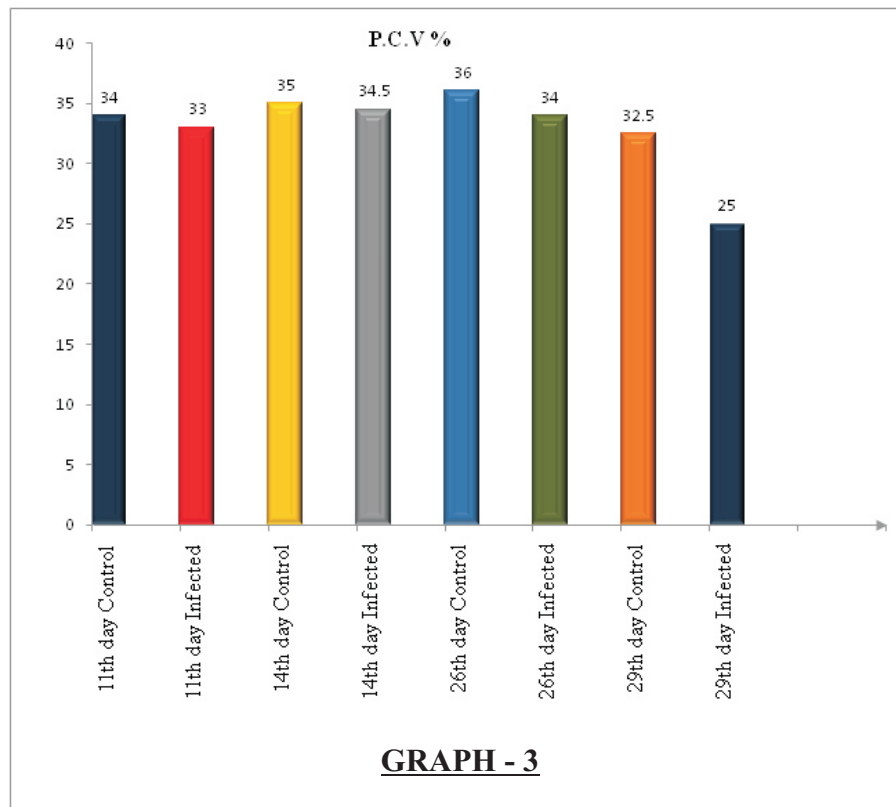
On the 11<sup>th</sup>, 14<sup>th</sup>, 26<sup>th</sup>, 29<sup>th</sup>, days the Basophils were 1% in all control group (group – A). While after primary infection (group – B) on 11<sup>th</sup>, 14<sup>th</sup> days it were 2%, 1% and after secondary infection (group – B<sub>1</sub>) on the 26<sup>th</sup>, 29<sup>th</sup> days it were 3%, 2% (non - significant). (GRAPH – 9)

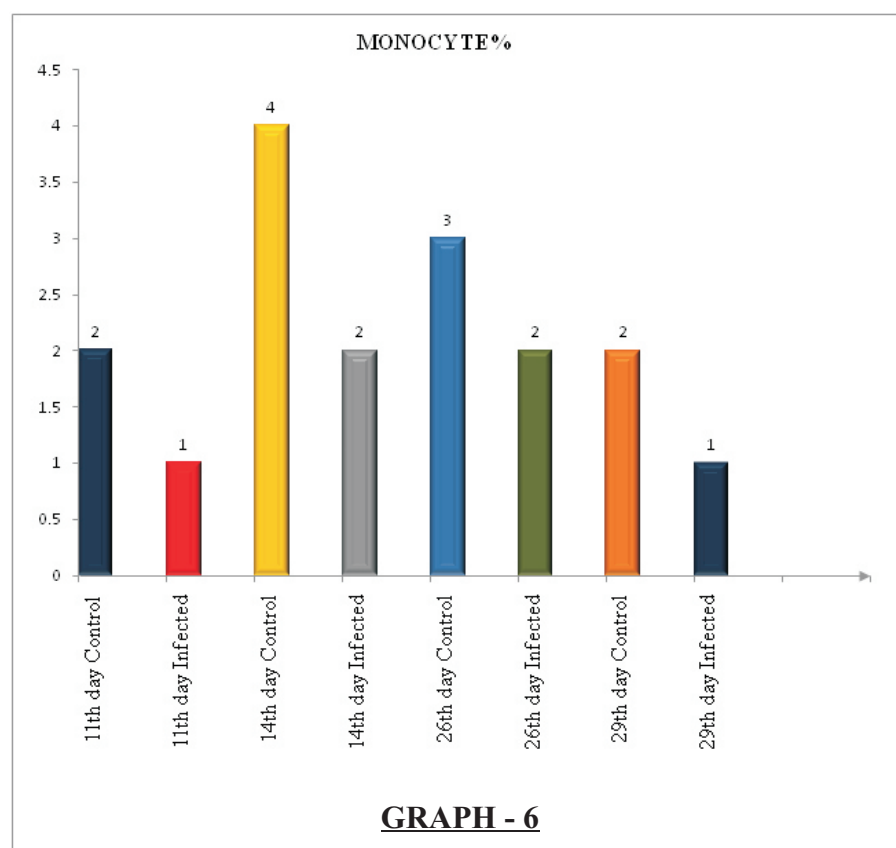
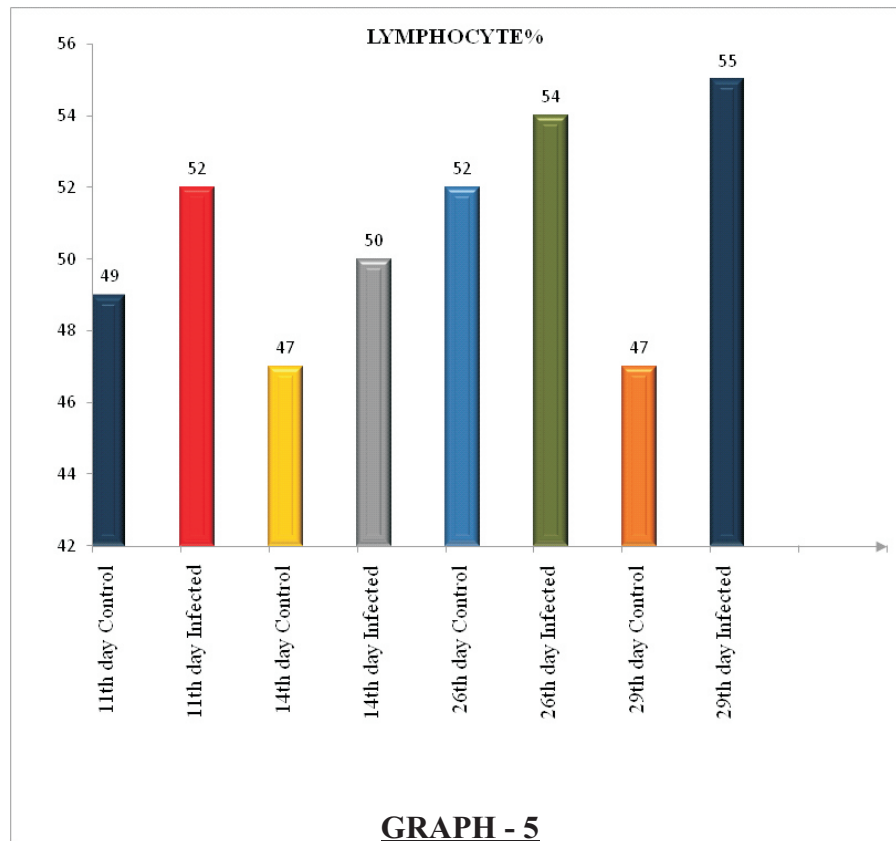
**Table 1: Haematological modulation in chicks infected with primary and secondary dose (250 embryonated) of *A. galli*.**

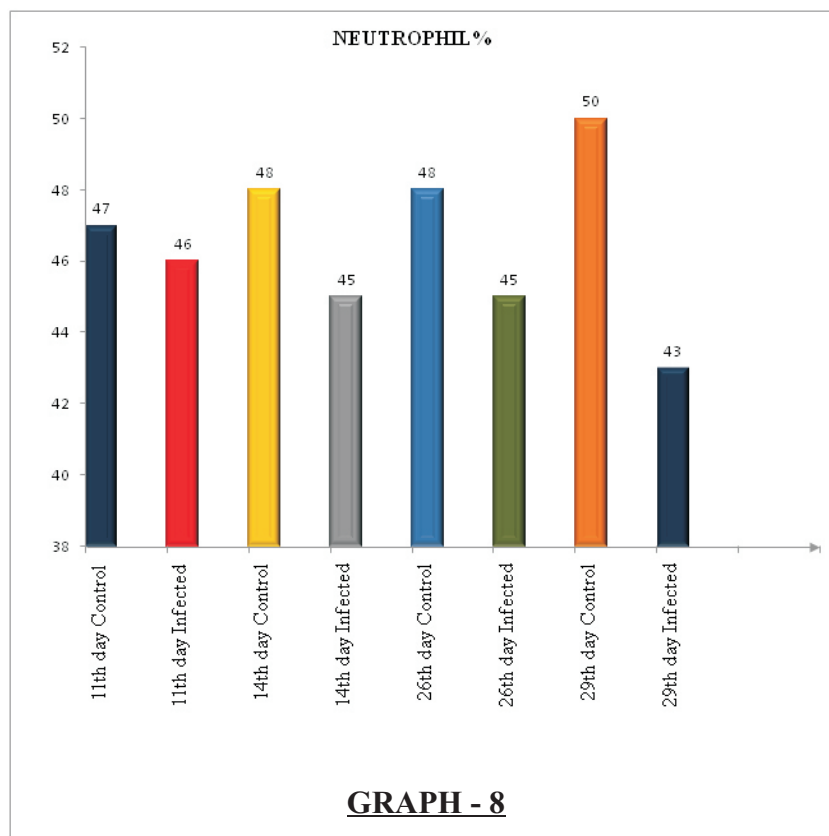
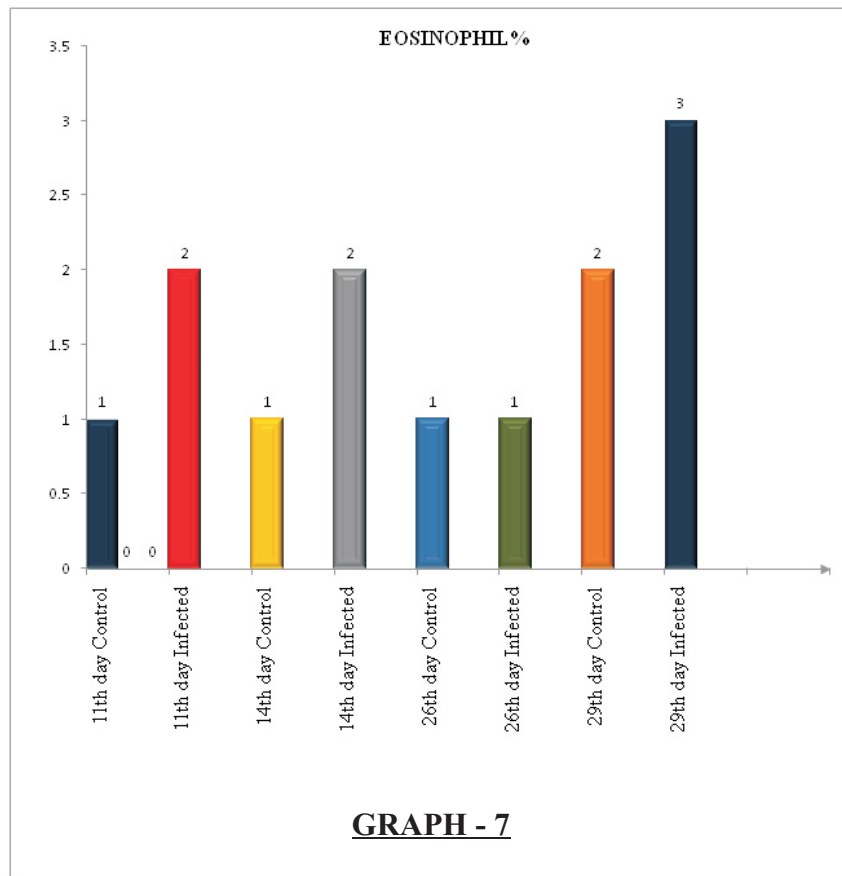
PARAMETERS	PRIMARY INFECTION				SECONDARY INFECTION			
	11 <sup>th</sup> day		14 <sup>th</sup> day		26 <sup>th</sup> day		29 <sup>th</sup> day	
	Control	Infected	Control	Infected	Control	Infected	Control	Infected
<b>R.B.C Mill/mm<sup>3</sup></b>	<b>6.0</b>	<b>5.2</b>	<b>5.8</b>	<b>5.7</b>	<b>6.0</b>	<b>5.6</b>	<b>5.4</b>	<b>4.3</b>
S.D	±0.2	±0.2	±0.5	±0.4	±1.0	±0.2	±0.2	±0.5
S.E	±0.57	±0.11	±0.28	±0.23	±0.57	±0.11	±0.11	±0.28
<b>T.L.C 10<sup>3</sup>/mm<sup>3</sup></b>	<b>4.6</b>	<b>6.25</b>	<b>6.1</b>	<b>7.3</b>	<b>5.0</b>	<b>8.95</b>	<b>7.7</b>	<b>9.0</b>
S.D	±3.0	±5.0	±1.0	±2.0	±2.0	±3.0	±1.0	±4.0
S.E	±1.7	±2.8	±0.57	±1.1	±1.1	±1.7	±0.57	±2.3
<b>P.C.V %</b>	<b>34</b>	<b>33</b>	<b>35</b>	<b>34.5</b>	<b>36</b>	<b>34</b>	<b>32.5</b>	<b>25</b>
S.D	±1.0	±1.0	±1.0	±0.5	±1.0	±2.0	±1.9	±2.0
S.E	±0.5	±0.57	±0.57	±0.28	±0.57	±1.1	±1.09	±1.1
<b>HAEMOGLOBIN%</b>	<b>11.3</b>	<b>11.0</b>	<b>11.2</b>	<b>11.4</b>	<b>12.0</b>	<b>11.3</b>	<b>10.8</b>	<b>8.3</b>
S.D	±0.1	±0.2	±0.4	±0.3	±0.1	±0.2	±0.4	±0.2
S.E	±0.05	±0.11	±0.23	±0.17	±0.05	±0.11	±0.23	±0.11
<b>LYMPHOCYTE%</b>	<b>49</b>	<b>52</b>	<b>47</b>	<b>50</b>	<b>52</b>	<b>54</b>	<b>47</b>	<b>55</b>
S.D	±4.0	±2.0	±1.0	±1.0	±1.0	±2.0	±2.0	±1.0
S.E	±2.3	±1.1	±0.57	±0.57	±0.57	±1.1	±1.1	±0.57
<b>MONOCYTE %</b>	<b>2.0</b>	<b>1.0</b>	<b>4.0</b>	<b>2.0</b>	<b>3.0</b>	<b>2.0</b>	<b>2.0</b>	<b>1.0</b>
S.D	±0.2	±0.2	±0.1	±0.4	±0.2	±0.1	±0.4	±0.3
S.E	±0.11	±0.11	±0.05	±0.23	±0.11	±0.05	±0.23	±0.17
<b>EOSINOPHIL %</b>	<b>1.0</b>	<b>2.0</b>	<b>1.0</b>	<b>2.0</b>	<b>1.0</b>	<b>1.0</b>	<b>2.0</b>	<b>3.0</b>
S.D	±0.1	±0.5	±0.6	±0.7	±0.1	±0.3	±0.1	±0.1
S.E	±0.05	±0.28	±0.34	±0.4	±0.05	±0.17	±0.05	±0.05
<b>NEUTROPHIL %</b>	<b>47</b>	<b>46</b>	<b>48</b>	<b>45</b>	<b>48</b>	<b>45</b>	<b>50</b>	<b>43</b>
S.D	±1.0	±1.0	±1.0	±3.0	±1.0	±1.0	±2.0	±3.0
S.E	±0.57	±0.57	±0.57	±1.7	±0.57	±0.57	±1.1	±1.7
<b>BASOPHIL %</b>	<b>1.0</b>	<b>2.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>3.0</b>	<b>1.0</b>	<b>2.0</b>
S.D	±0.2	±0.1	±0.1	±0.3	±0.6	±0.1	±0.2	±0.3
S.E	±0.11	±0.05	±0.05	±0.17	±0.34	±0.05	±0.11	±0.17

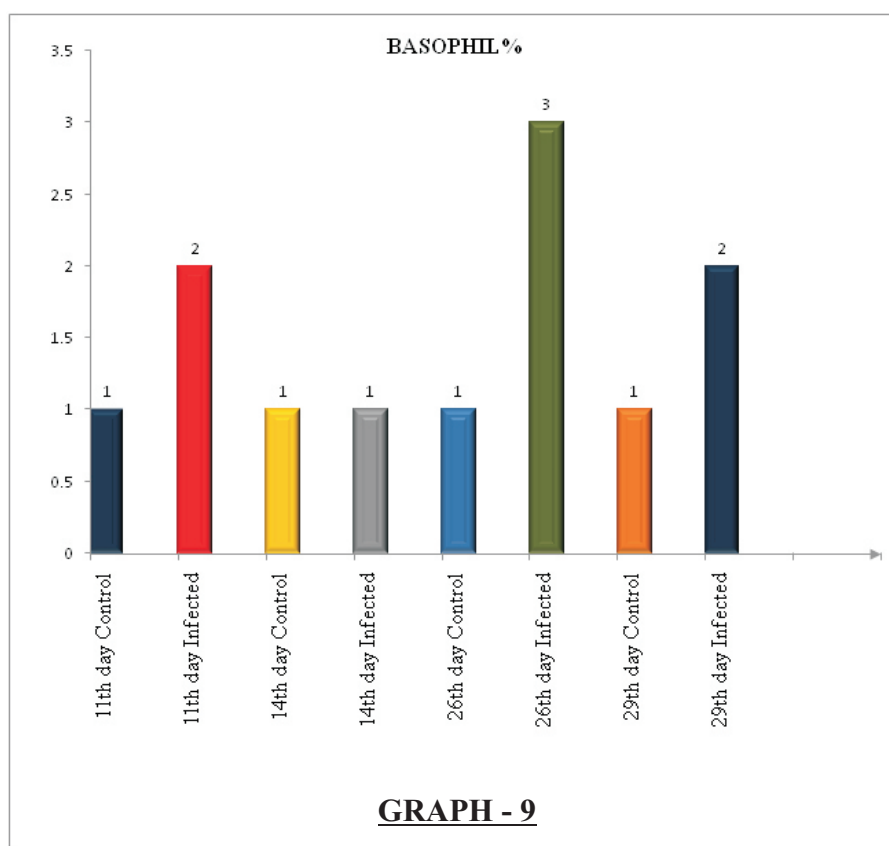
**GRAPH - 1****GRAPH - 2**











Man or animal show antibody response to infection organisms not once or twice but several times on the first second contacts with antigens, the basis for development of immunity can be studied (Roitt, 1991) In primary response the antibody reach a peak, after several days and then decline with second exposure of same antigen, the blood antibodies reach much higher value than observed in primary immune response. Secondary immune response involves abundant production of antibodies.

In the Haematological studies the total erythrocytes, packed cell volume, haemoglobin concentration, monocytes, neutrophils was decrease in comparison to control in both group (group - B and group - B<sub>1</sub>) infected group.

Lowered TEC in *Ascaridia galli* infected chickens might be due to lowered erythropoiesis. *A. galli* are usually associated with mild/acute enteritis which hampers the absorption of essential nutrients for blood cell formation. PCV may have decreased due to the lower concentration of erythrocytes per unit volume of blood in the infected group of chickens. The lowered haemoglobin concentration in infected birds was correlated with the activities of early larval stage of *A. galli* in the process of penetration with resultant destruction of mucosa of small intestine and rupture of small blood vessels. The fall of Hb content might be due to metabolic disturbance caused by worms rather than a direct blood loss.

While total leucocytes, lymphocytes,

eosinophils and basophils increased. The increased number of eosinophils in the blood is an indication of parasitic infection. The net increase in the total leucocytic count might be due to the increase in eosinophils.

In the secondary immune responses increased value for antibodies, basophils, monocyte, eosinophil cells and lymphocytes increased values depicting more haematological responses along with immunological responses.

## CONCLUSION

Haematological study showed that the total erythrocytic count (TEC), packed cell volume (PCV) and haemoglobin (Hb) percentage decreased significantly in infected groups of chickens when compared to the control group. The total leucocytic count (TLC) showed significant increase in infected groups of chickens. Eosinophils and basophils increased significantly in all the infected groups of chickens whereas monocytes decreased. Lymphocytes increased significantly in all the infected groups when compared to the control group.

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## PREPARATION OF ZINC (II) AND CADMIUM (II) COMPLEXES OF THE 12-MEMBERED TETRAAZA MACROCYCLIC LIGAND : SYNTHESIS AND SPECTROSCOPIC CHARACTERIZATION

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### ABSTRACT

We describe the synthesis and characterization of two new zinc (II) and cadmium (II) complexes of Macrocylic Ligand prepared from O-Phenylenediamine and ethylenediamine. The complexes were synthesized by treating an ethanolic solution of the ligand with equimolar amounts of appropriate metal salts in 1 M methanolic solution of NaOH or alternatively, by a more direct route in which the two reactants are added to a solution of the ligand immediately after formation of the latter and prior to any isolation. The complexes were characterized by elemental analysis, FTIR, <sup>1</sup>H-NMR, electronic spectra and molar conductivity. According to obtained data, the probable coordination geometries of zinc and cadmium in these complexes with N donor atoms are tetrahedral- and octahedral-like respectively. Both complexes were found to be 1:1 electrolyte systems in acetonitrile.

**Keywords:** Tetraaza macrocylic ligand; schiff base; unsymmetric; zinc; cadmium; complex.

Macrocycles have often been used as chelating ligands in the field of coordination

chemistry and their metal complexes are of great interest for many years. It is well known that N and S atoms play a key role in the coordination of metals at the active sites of numerous metallobiomolecules [1]. Schiff base metal complexes have been widely studied because they have industrial, antifungal, antibacterial, anticancer and herbicidal applications [2-3]. They serve as models for biologically important species and find applications in biomimetic catalytic reactions. Chelating ligands containing N, S and O donor atoms show broad biological activity and are of special interest because of the variety of ways in which they are bonded to metal ions. It is known that the existence of metal ions bonded to biologically active compounds may enhance their activities [4-6]. The variety of possible Schiff base metal complexes with wide choice of ligands, and coordination environments, has prompted us to undertake research in this area [7]. Zinc can function as active site of hydrolytic enzymes, where it is ligated by hard donors (N or O). It has long been recognized as an important co-factor in biological molecules, either as a structural template in protein folding or as a Lewis acid catalyst that can readily adopt

the coordination numbers 4, 5, or 6 [8-10]. The catalytic role of Zn comprises Lewis acid activation of substrate, generation of a reactive nucleophile (Zn-OH) and stabilization of the leaving group [11]. There is substantial interest in the coordination chemistry of cadmium complexes because of the toxic environmental impact of cadmium. The mobilization and immobilization of cadmium in the environment, in organisms, and in some technical processes (such as in ligand exchange chromatography) have been shown to depend significantly on the complexation of the metal center by chelating nitrogen donor ligands [12]. As a part of our continuing work on dissymmetric tetradentate Schiff base complexes containing N, S and O donor atoms [13-14] and in light of the importance of Cd and Zn ion metals, we now report the synthesis and characterization of zinc (II) and cadmium (II) complexes of the tetradentate unsymmetric Schiff base ligand 2-((E)-(2-(2-(pyridine-2-yl)ethylthio)-ethylimino)methyl)-4-bromophenol and a brief study of its coordination behavior with the d10 group elements.

## MATERIALS AND METHODS

### General

All the chemicals and solvents used for the syntheses were of reagent grade and were obtained commercially from Merck Company with the exception of the cadmium nitrate, which was obtained from Aldrich. The solvents were purified by standard methods [15]. The ligand (PytBrsalH) was synthesized and characterized according to a published method [14] from 1-(2-pyridyl)-3-thia-5-aminopentane (pyta) [14-16] and 2-vinyl pyridine distilled in

vacuum before use.

### Physical measurements

The infrared spectra of the ligand and complexes were recorded on a Shimadzu Prestige 21 FT-IR spectrometer as KBr disks. Elemental CHN analyses were performed using a Heraeus CHN-O-RAPID elemental analyzer. <sup>1</sup>H NMR and spectral measurements were carried out on a Bruker Spectrospin Avance 400 MHz ultrashield spectrometer with TMS as an internal reference. The conductivity measurements were carried out in acetonitrile at room temperature using a Hanna HI 8828N conductometer. The electronic spectra of the compounds were recorded in acetonitrile on a Perkin-Elmer Lambda 25 (UV-Vis) spectrophotometer.

*General procedure for the synthesis of metal complexes* A solution of the ligand was prepared by either dissolving the required amount of the ligand (1 mmol) in absolute ethanol (10 mL) or by preparing the ligand *in situ* from its precursors as follows: a solution of pyta (1 mmol) in absolute ethanol (5 mL) was added to solution of 2-hydroxy-5-bromobenzaldehyde (1 mmol) in absolute ethanol (5 mL) and the mixture was refluxed for 40 min and then 1 M methanolic NaOH (1 mL) was added and reflux and stirring were continued for a further 3 min. Then Cd(NO<sub>3</sub>)<sub>2</sub>·4H<sub>2</sub>O or ZnCl<sub>2</sub> (1 mmol) in absolute ethanol (5 mL) was added to the ligand solution with stirring and the reaction mixture was further stirred under reflux for 30 min. The obtained colored solution was left standing at room temperature to crystallize. The product

was removed by filtration, washed with cooled absolute ethanol, recrystallized from acetonitrile or methanol and dried under vacuum. The analytical and physical data of the complexes are:

*[Zn(PytBrsal)]Cl* - Empirical formula: C<sub>16</sub>H<sub>16</sub>BrClN<sub>2</sub>OSZn; formula weight: 465.13 gmol<sup>-1</sup>; yield: 66%; appearance: yellowish microcrystals; m.p. = 165-166 °C (decomposed); Elem. analysis: calc. C, 41.32 %; H, 3.47 %; N, 6.02 %; found: C, 41.45 %; H, 3.49 %; N, 6.13%; FTIR: 3049 cm<sup>-1</sup> ν(C-H) aromatic, 2860-2916 cm<sup>-1</sup> ν(C-H) aliphatic, 1622 cm<sup>-1</sup> ν(C=N) iminic, 1285 cm<sup>-1</sup> ν(C-O) phenolic. 1H-NMR *Molecules* 2008, 13 809 (ppm): 8.96 (d, 1H, pyridinic), 8.31 (s, 1H, iminic), 7.89 (t, 1H, pyridinic), 7.72- 7.51 (m, 4H, aromatic), 7.24 (d, 1H, aromatic), 3.91 (t, 2H, CH<sub>2</sub> aliphatic), 3.25 (t, 2H, CH<sub>2</sub> aliphatic), 3.05 (t, 2H, CH<sub>2</sub> aliphatic), 2.93 (t, 2H, CH<sub>2</sub> aliphatic); mol. conductivity: 143 μS; electronic spectrum: 238 nm (37,150 mol<sup>-1</sup>Lcm<sup>-1</sup>), 314 nm (9,646 mol<sup>-1</sup>Lcm<sup>-1</sup>), 397 nm (2,741 mol<sup>-1</sup>Lcm<sup>-1</sup>). *[Cd(PytBrsal)]NO<sub>3</sub>·2H<sub>2</sub>O* - Empirical formula: C<sub>16</sub>H<sub>20</sub>CdBrN<sub>3</sub>O<sub>6</sub>S; formula weight: 574.462 gmol<sup>-1</sup>; yield: 72 %; appearance: light yellow microcrystals; m.p. = 210-211°C (decomposed); Elem. analysis: calc. C, 33.45 %; H, 3.51 %; N, 7.31 %; found: C, 33.31 %; H, 3.50 %; N, 7.19%; FTIR: 3530-3150 cm<sup>-1</sup> ν(O-H) H<sub>2</sub>O coordinated, 3035-3050 cm<sup>-1</sup> ν(C-H) aromatic, 2910 cm<sup>-1</sup> ν(C-H) aliphatic, 1639 cm<sup>-1</sup> ν(C=N) iminic, 1379 cm<sup>-1</sup> ν(NO<sub>3</sub>-), 1298 cm<sup>-1</sup> ν(C-O) phenolic, 820 cm<sup>-1</sup> ν(NO<sub>3</sub>-); 1H-NMR (ppm): 8.94 (d, 1H, pyridinic), 8.35 (s, 1H, iminic), 7.90 (t, 1H, pyridinic), 7.70- 7.45 (m, 4H, aromatic), 7.27

(d, 1H, aromatic), 3.94 (t, 2H, CH<sub>2</sub> aliphatic), 3.30 (t, 2H, CH<sub>2</sub> aliphatic), 3.07 (t, 2H, CH<sub>2</sub> aliphatic), 2.91 (t, 2H, CH<sub>2</sub> aliphatic); mol. conductivity 137 μS; electronic spectrum: 235 nm (42,970 mol<sup>-1</sup>Lcm<sup>-1</sup>), 330 nm (10,935 mol<sup>-1</sup>Lcm<sup>-1</sup>), 385 nm (4,106 mol<sup>-1</sup>Lcm<sup>-1</sup>).

## RESULTS AND DISCUSSION

The ligand (PytBrsalH) was prepared as reported in the literature [14] by the condensation in ethanol of 1-(2-pyridyl)-3-thia-5-aminopentane (pyta) with 5-bromosalicylaldehyde. It was characterized by elemental analysis, IR, 1H- and 13C-NMR spectral data. The corresponding cadmium and zinc complexes were prepared by treating an ethanolic solution of the ligand with equimolar amounts of ZnCl<sub>2</sub> or Cd(NO<sub>3</sub>)<sub>2</sub>·4H<sub>2</sub>O and methanolic NaOH, or alternatively, by a more direct route in which the two reactants are added to a solution of the ligand immediately after formation of the latter and prior to any isolation (Scheme 1). The same products are obtained by both routes, but the latter was less time consuming and gave higher yields. These complexes were stable in the solid state at ambient conditions, and were characterized by the usual methods: elemental analysis, FTIR, 1H-NMR, molar conductivity and absorption electronic spectroscopy. The characteristic IR bands of Zn(II) and Cd(II) complexes are: 1622 and 1639 cm<sup>-1</sup> (ν(C=N) iminic), 1285 and 1298 cm<sup>-1</sup> (ν(C-O) phenolic), respectively, [14,17-18]. The latter are shifted from the 1243-1275 cm<sup>-1</sup> range seen for the free Schiff base ligand, thus indicating coordination of the phenolic oxygen [19]. The presence of coordinated water molecules in the cadmium complex is supported

by a broad IR band in the 3530-3150  $\text{cm}^{-1}$  region and its elemental analysis data [1]. The measurement of molar conductivities at  $10^{-3}$  M concentration carried out in acetonitrile, the obtained  $\Lambda_M$  values for monocationic complexes, indicating a behavior attributable to 1:1 electrolytes [21].

**Scheme 1:** Schematic representation of ligand and metal complex formation.

$\text{N S NH}_2$   
 $\text{HO}$   
 $\text{OHC Br}$   
 Reflux  
 ethanol  
 $\text{PytBrsalH}$   
 $\text{S N}$   
 $\text{N}$   
 $\text{HO Br} +$   
 $\text{N S NH}_2$   
 $\text{HO}$   
 $\text{OHC Br}$   
 $\text{ZnCl}_2 \text{ or Cd(NO}_3)_2$   
 $\text{EtOH}$   
 Reflux  
 $\text{S N}$   
 $\text{NO}$   
 $\text{Br}$   
 $\text{Cd}$   
 $\text{OH}_2$   
 $\text{NO}_3$   
 $\text{NaOH}$   
 $\text{OH}_2$   
 $\text{S N}$   
 $\text{NO}$   
 $\text{Br}$   
 or  $\text{Zn Cl} + +$

In NMR spectra of the complexes we observed an electron density shift from the

ligand to the metal. The signals of the azomethine protons appear deshielded at 8.31 and 8.35 ppm in the zinc and cadmium complexes, respectively, as compared to 8.26 ppm in the Schiff base, inferring coordination through the azomethine nitrogen atom of the ligand [7, 20]. Disappearance of the  $-\text{OH}$  protons in the spectra of the complexes supported the deprotonation of the phenolic group [7]. The cadmium and zinc complexes show only the charge transfer transitions which can be assigned to charge transfer from the ligand to the metal and vice versa, no d-d transition are expected for d10  $\text{Zn(II)}$  and  $\text{Cd(II)}$  complexes [7]. In the electronic spectra of both complexes, recorded in acetonitrile solution (Figures 1 and 2), an absorption band in the range 320-397 nm was observed, which may be associated with a  $\pi \rightarrow \pi^*$  transition originating mainly in the azomethine chromophore (imine  $\pi \rightarrow \pi^*$  transition). In the UV region, the complexes show one strong absorption band at 235–238 nm which may be assigned to benzene ring  $\pi \rightarrow \pi^*$  transition [22-25]. *Molecules* 2008, 13 807

**Figure 1.** Electronic spectrum of  $[\text{Zn(PytBrsal)}]\text{Cl}$ .

**Figure 2.** Electronic spectrum of  $[\text{Cd(PytBrsal)}]\text{NO}_3$

The present study of the title complexes continues our structural study of the corresponding copper complex of the ligand [13], which included the determination of its crystal structure by X-ray crystallography. The

crystallographic data revealed one mode of complexation through the nitrogen atoms of the azomethine and pyridine groups, the oxygen atom of the deprotonated phenolic group and the thioether sulfur atom. On the basis of the spectral data, elemental analysis and comparison with our *Molecules* 2008, 13 808 previous data it is suggested that the zinc complex probably has a tetrahedral structure, with coordination number 4 and the cadmium one has an octahedral structure with coordination number 6, that includes two molecules of coordinated water coming from the hydrated salt used in its preparation.

This would be consistent with the elemental analysis data and the water peaks observed in the FTIR spectrum [7, 26-27].

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## **EFFECT OF MARIGOLD INTER CROPPING ON BANANA CROP (*Musa paradisiacal* L.) cv GRAND NAIN WITH REFERENCE TO NEMATODE MANAGEMENT.**

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### **ABSTRACT**

**Effect of marigold on yield and vegetative growth was conspicuous. Single row, Double row, Alternate row, Circular, Ex-situ mulching, In-situ mulching, Green-manuring and Drenching treatments were significantly superior over control. Double row planting was best in term of vegetative growth and reproduction among all the treatments tried. Dead plants of marigold could not influence any parameter at par as that of live plants. Bunch weight was very high in marigold plantings. Double row system accommodates more no of plants per unit area hence roots have exuded more antagonistic as compared sparse planting. Shooting was earlier in Double row system as compared to other treatments. Tallest plants (3.20m) were observed in double row system. Similarly, Stem girth (90.01cm), Petiole girth (29.01cm), Whorl diameter (142.89cm), Leaves plan t(23.12), Leaf lamina width (60.01cm) and Number of Leaves at flowering were also significantly greater in double row system. Values were lowest in control. Findings are in conformity that marigold as intercrop has synergistic effect in growth and yield of banana crop.**

**Keywords:** Marigold, banana nematode, intercrop, yield, growth.

Banana is a herbaceous fruit plant, Due to farmers awareness and higher income it is recently has become popular in Allahabad and adjoining areas. Nematodes have been reported the major cause to reduce yield and quality of banana crop. Impacting cropping systems in Allahabad are the root knot, reniform, cyst, burrowing, and lesion nematodes, all of which contain spear-like mouthparts used to puncture plant roots and obtain nutrients. These nematodes cause significant economic damage to a wide variety of crops. After crops are infected with nematodes, crop yield and quality are reduced; either directly from root deformation caused by nematode feeding or indirectly from predisposition to infection by other pathogens that result from nematode penetration into the roots. The methods most frequently used for managing nematodes in agriculture include rotating crops with plants that are not hosts of plant-parasitic nematodes, using resistant plants if available, and applying chemical nematicides. Additional methods include soil solarization and the use of organic amendments, trap crops, microbial bio-control agents, and plants that are antagonistic to

parasitic nematodes. While marigolds (*Tagetes* species) are typically grown for ornamental purposes as bedding plants, studies have found that they can be highly toxic to plant-parasitic nematodes and are capable of suppressing a wide range (up to 14 genera) of nematode pests. The nematicidal potential varies with the marigold species and cultivar. The marigold species most often used for nematode control are *Tagetes patula*, *T. erecta*, and *T. minuta*. The key mode by which marigolds suppress plant-parasitic nematodes is through a biochemical interaction known as allelopathy. Marigold plants produce a number of potentially bioactive compounds. Sulfur-containing compounds is abundant in marigold tissues, including roots. It has nematicidal, insecticidal, fungicidal, antiviral, and cyto-toxic activities, and it is believed to be the main compound responsible for the nematicidal activity of marigold. Thus nematodes may be killed either by entering the root system of a marigold plant or contacting soil containing marigold's bioactive compounds. The nematicidal activity of marigold has been detected in roots of growing plants but not in root or leaf extracts. Some studies have shown that these nematicidal properties result from a sequence of events in the marigold roots triggered by penetration and movement of nematodes through the root tissue, and the end product of these reactions is thought to kill nematodes. Nematicidal compounds apparently permeate from marigolds' root tissues into nematodes attached to the root, but they are also believed to kill nematodes found in the rhizosphere, the soil near marigold roots. Thus, marigold is believed to be most effective in suppressing plant-parasitic nematodes when

actively growing, but it is not as effective when incorporated as crop residues or root extracts. Several other plants with nematicidal properties, including sun- hemp (*Crotalaria juncea*), are believed to release nematicidal compounds when incorporated into the soil and thus do not require root penetration to effectively kill nematodes. Some researchers believe that marigold root exudates prevent the nematodes from developing and their eggs from hatching. However, the nematode species and growth stages suppressed by marigold vary with the marigold species

Keeping above facts in view present investigation entitled *Effect of marigold intercropping on Banana crop (Musa paradisiaca L.) cv GRAND NAIN with reference to nematode management* was carried out to standardized marigold intercropping in Allahabad region.

## MATERIALS AND METHODS

The experiment was carried out in the Department of Horticulture, Kulbhaskar Ashram Post Graduate College, Allahabad during the year 2011-2012. Eight treatment that is Single row, Double row, Alternate row, Circular pattern,, Ex-situ mulching, In-situ mulching, Green-manuring and Drenching were tried thus making nine treatment including a control. The experiment was carried out in Randomized Block Design with three replication. There were 10 plants in each plot. Marigold Cultivar Pusa Narangi was planted as per treatment. Grand Nain variety of banana was taken for response. Two months after banana transplanting marigold seedlings were transplanted. After soil analysis recommended

dose of fertilizers was applied Extra dose of fertilizer was given for marigold so that banana crop may not suffer due to marigold crop nutrition. As per schedule cultural package of practices were applied. Precautions were taken that root zone of marigold should not disturb as root system is the potential source for allelopathy. In single row only one row and in double row two row of marigold were planted between two rows of banana. In circular system six marigold plants were planted around single banana plant. In ex-situ method marigold plants were grown another field then after full growth uprooted and mulched in between banana row. In in-situ marigold plants were grown in banana field two months before planting then uprooted and mulched. In green manuring before planting marigold crop incorporated in soil to decay. In drenching marigold plant extract @half liter was applied at the root zone after three months of planting.

## RESULTS AND DISCUSSION

The effect of marigold intercropping was encouraging. Except control all treatments were better to increase growth and yield of banana plant. Double row planting was best in term of vegetative growth and reproduction among all the treatments tried. Dead plants of marigold could not influence any parameter at par as that of live plants. Bunch weight was very high in marigold plantings. Double row system accommodates more no of plants per unit area hence roots have exuded more antagonistic as compared sparse planting. Shooting was earlier in Double row system as compared to other treatments. Tallest plants (3.20m) were observed in double row system. Similarly, Stem

girth (90.01cm ),Petiole girth (29.01cm), Whorl diameter(142.89cm),Leaves/plant(23.12),Leaf lamina width (60.01cm) and Number of Leaves at flowering were also significantly greater in double row system . Values were lowest in control. Findings are in conformity that marigold as intercrop has synergistic effect in growth. Lehman, (1979) said that marigolds are sensitive to day-length, having what is called short-day photoperiodism. In general, the plant remains vegetative when days are long and flowers when days are short. Because Hawai'i's day-length is generally short compared to the summer months of temperate zones, marigolds with a strong sensitivity to short-day photoperiod tend to flower quickly even during our longest days. Topp et al.(1998). Reported that marigold can conveniently be grown as part of a multi crop system, rotated or grown as an intercrop with other plants. In these cases, marigold should be seeded to obtain a high plant population and grown for its full vegetative growth period, at the end of which it can be incorporated into the soil as a green manure, thereby increasing soil organic matter. *Tagetes erecta* 'CrackerJack' or *T. patula* 'Single Gold' may be sown at 20 plants/m<sup>2</sup> A marigold cover crop can be grown for two to four months during the summer season, most timely period being right after termination of a spring vegetable crop. Sipe, et al (1997) evaluated sun- hemp, marigold, and cowpea for their ability to reduce the occurrence of aphid-borne non-persistent viruses and suppress weed, insect, and nematode pests directly through modification of the cropping environment and enhancement of beneficial organisms. He said

that integrated pest management programs, cover crops should not be used solely to mitigate problems caused by plant parasitic nematodes, but rather used simultaneously to

help suppress multiple pest organisms). Findings are in conformity with the findings of Ploeg et al. (1999), Ploeg, (2002) ,Natarajan (2006).

**Table-1 EFFECT OF MARIGOLD INTERCROPPING ON VEGETATIVE GROWTH OF BANANA CROP c.v. GRAND NAIN.**

Sl.N.	Treatments	Plant height (m)	Stem girth (cm)	Petiole girth (cm)	Whorl dia. (cm)	Leaves/ plant (No)	Leaf lamina width (cm)	Leaves at flowering (No)
1	Single row M <sub>1</sub>	2.58	60.11	15.74	80.12	18.42	51.75	7.22
2	Double row M <sub>2</sub>	3.20	90.01	29.01	142.89	23.12	60.01	9.44
3	Alternate, row M <sub>3</sub>	2.59	60.21	16.36	75.44	19.13	52.85	6.44
4	Circular M <sub>4</sub>	2.80	74.44	28.52	100.41	21.41	59.91	7.52
5	Ex-situ, mulching M <sub>5</sub>	2.57	60.12	16.01	75.84	18.74	53.88	7.52
6	In-situ, mulching M <sub>6</sub>	2.75	72.36	25.23	84.00	20.14	58.95	7.55
7	Green manuring M <sub>7</sub>	2.45	59.02	15.88	74.52	17.41	46.72	5.96
8	Drenching M <sub>8</sub>	2.46	59.44	15.69	72.45	17.32	46.74	5.68
9	Control M <sub>9</sub>	2.45	58.12	15.88	74.44	16.33	46.70	5.44
10	SEM <sup>+</sup>	1.13	1.60	1.85	1.80	1.41	0.90	0.80
11	CD at 5%	0.60	0.80	0.99	0.90	0.70	0.04	0.07

**Table-2 EFFECT OF MARIGOLD INTERCROPPING ON REPRODUCTIVE GROWTH OF BANANA CROP c.v. GRAND NAIN.**

Sl.N.	Treatments	Shooting time (days)	Spadix opening time (days)	Bunch length (cm)	Hands/ bunch (No)	Fingures /bunch (dozen)	Maturity time (days)	Bunch weight (Kg)
1	Single row M <sub>1</sub>	252.04	21.11	74.74	12.74	21.42	121.75	57.22
2	Double row M <sub>2</sub>	211.00	17.01	89.01	18.01	35.12	112.01	79.44
3	Alternate row M <sub>3</sub>	245.23	20.21	77.36	13.36	24.13	122.85	56.44
4	Circular M <sub>4</sub>	230.56	18.00	74.52	12.52	22.41	121.91	57.52
5	Exsitu, mulchin M <sub>5</sub>	254.36	19.12	75.01	14.01	25.74	122.88	47.52
6	In-situ mulching M <sub>6</sub>	242.23	19.36	72.23	12.23	20.14	121.95	47.55
7	Green manuring M <sub>7</sub>	259.22	22.02	70.08	15.08	28.41	125.72	45.96
8	Drenching M <sub>8</sub>	2.46	22..44	71.69	15.69	28.32	125.74	45.68
9	Control M <sub>9</sub>	2.45	23.12	69.88	15.88	26.33	123.70	45.44
10	SEM <sup>+</sup>	1.13	1.01	1.25	1.05	1.41	1.90	0.80
11	CD at 5%	0.60	0.40	0.80	0.70	0.70	0.84	0.27

## CONCLUSION

Findings are very encouraging and it may be advocated to farmers that marigold intercropping is beneficial for yield and nematode management. Two rows of marigold in between banana plantation must be practiced for remunerative yield.

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## EFFECT OF DIFFERENT LEVELS OF IRON AND CITRIC ACID OR THEIR COMBINATION ON BODY WEIGHT AND WEIGHT GAIN OF BROILER CHICKS

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### ABSTRACT

An experiment was conducted to evaluate the effects of four different levels of iron, 60, 80, 100 and 120 mg; four different levels of citric acid, 0.2, 0.4, 0.6 and 0.8%; and their combination on body weight and weight gain of broiler chicks. There were 24 treatments and the control with no iron or citric acid. Results show that the mean body weight (g) of broiler chicks per week in the different treatments ranged from 509.73 g to 661.87 g. There were significant differences ( $p \leq 0.05$ ) among the treatments, while  $T_6$ ,  $T_9$  and  $T_{10}$  were most outstanding. There was a constant gain in body weight over the 5-week, where  $T_6$ ,  $T_9$  and  $T_{10}$  were most outstanding.

Weight gain average per week ranged from 188.40 g to 242.53 g. There were significant differences ( $p \leq 0.05$ ) among the treatments. There was a constant increase in weight gain from week 1 to week 3 and then a slight increase or decrease during week 4 and 5. It was found that the supplementation of the diets with iron and citric acid allowed a healthy, positive growth performance of the birds, since there was no mortality.

**Keyword :** Effect, level, broiler chicks.

Poultry chicken meat production plays a large part of food security in the face of the rapid

increasing world population. It is critically important for this industry to continue to provide a great deal of a person's daily animal protein requirement. Growth of the broiler industry is characterized as robust but volatile (Anonymous, 2011). However, a major concern is the need to improve the quality of meat and self sufficiency. Consequently, the use of dietary alternatives has been recommended to enhance performance of broiler chicks, two of which are iron and citric acid. It is well known that trace minerals in basal diets affects growth performance, immune responses, and meat quality. Iron can correct or prevent anemia, in addition to being directly involved in hemoglobin functions (McNaughton and Day 1979). Iron deficiency anemia is a common nutritional deficiency and Fe fortification of diets is necessary to alleviate this problem. Citric acid (CA) is another supplement, which is known to enhance nutrient utilization, growth and feed efficiency in broilers. It is very effective in improving Phosphorus (P) and other nutrients utilization in chickens, as well as, improves phytase enzyme activity (Boling-Frankenbach, 2001). Increasing the utilization of dietary P improves the performance and retention of mineral substances. Addition of CA in broiler diet was found to improve weight gain (Abdel-Fattah *et al*, 2008; Moghadam *et al*, 2006). Therefore, an experiment was conducted to determine the

effect of different levels iron and citric acid or their combination on body weight and weight gain of broilers chicks.

## MATERIALS AND METHODS

Seventy-five (75) broiler day old chicks of the same hatch were reared in battery cages. Each day old chick was weighed and distributed randomly among 25 treatments. There were 3 chicks, referred to as 3 replications, per treatment. The production cycle was up to 35 days (5 weeks) after hatching. Chicks were fed with self-prepared standard broiler starter ration from day 1 to day 21 (3 weeks) and then standard broiler finisher ration from day 22 to day 35 (4<sup>th</sup> and 5<sup>th</sup> weeks). The two types of ration (starter and finisher) were supplemented with different levels of iron and citric acid, either alone or in various combinations (Table 1). Table 2 shows the basal composition of the standard broiler starter ration and standard broiler finisher ration. These were fed *ad lib* to the birds. Body weight was recorded weekly to determine growth rate and weight gain of the chicks. All broilers had clean drinking water to be taken *ad lib* at all times.

## RESULTS AND DISCUSSION

The mean body weight (g) of broiler chicks per week in the different treatments ranged from 509.73 g to 661.87 g; and for each treatment from T<sub>0</sub> to T<sub>24</sub> were 572.80, 642.67, 590.00, 616.00, 602.00, 620.53, 659.47, 618.93, 638.27, 637.33, 661.87, 615.93, 639.47, 592.93, 580.67, 583.07, 615.20, 576.67, 561.33, 559.07, 635.07, 567.73, 582.93, 622.00 and 509.73, respectively. There were significant differences ( $p \leq 0.05$ ) among the treatments. The lowest mean body weight

(g), T<sub>24</sub> (509.73) was significantly different from all other treatments. The highest mean body weight, T<sub>10</sub> (661.87) was not significantly different from T<sub>6</sub> (659.47), T<sub>1</sub> (642.67), T<sub>12</sub> (639.47), T<sub>8</sub> (638.27), T<sub>9</sub> (637.33) and T<sub>20</sub> (635.07) but significantly different from all the other treatments. In Fig 1, it is clear that there was a constant gain in body weight over the 5-week period. Noticeably, T<sub>24</sub> recorded the lowest body weight throughout the period. The mean body weight had a doubling effect for the first 3 week and an increase by over 250 g each for weeks 4 and 5. In the end, T<sub>6</sub>, T<sub>9</sub> and T<sub>10</sub> were most outstanding.

In terms of weight gain, the average per week ranged from 188.40 g to 242.53 g; and for each treatment from T<sub>0</sub> to T<sub>24</sub> were 206.27, 227.73, 219.33, 225.20, 218.40, 229.60, 240.80, 225.60, 229.20, 242.53, 241.47, 222.93, 234.27, 220.40, 207.33, 210.67, 217.73, 217.20, 204.00, 200.40, 236.27, 226.00, 222.13, 235.87 and 188.40, respectively. There were significant differences ( $p \leq 0.05$ ) among the treatments. The highest mean weight gain, T<sub>9</sub> (242.53), was significantly different from T<sub>4</sub> (218.40), T<sub>16</sub>, T<sub>17</sub> (217.73), T<sub>15</sub> (210.67), T<sub>14</sub> (207.33), T<sub>0</sub> (206.27), T<sub>18</sub> (204), T<sub>19</sub> (200.40) and T<sub>24</sub> (188.40) but not significantly different from T<sub>10</sub> (241.47), T<sub>6</sub> (240.80), T<sub>20</sub> (236.27), T<sub>23</sub> (235.87), T<sub>12</sub> (234.27), T<sub>5</sub>, T<sub>8</sub> (229.60), T<sub>1</sub> (227.73), T<sub>21</sub> (226), T<sub>7</sub>, T<sub>3</sub> (255.60), T<sub>11</sub>, T<sub>22</sub> (222.93), T<sub>13</sub> (220.40) and T<sub>2</sub> (219.33). On the other hand, the lowest mean weight gain, T<sub>24</sub> (188.40), was not significantly different from T<sub>15</sub> (210.67), T<sub>14</sub> (207.33), T<sub>0</sub> (206.27), T<sub>18</sub> (204) and T<sub>19</sub> (200.40).

Fig. 2 shows a constant increase in weight gain from week 1 to week 3 and then a slight increase or decrease during week 4 and 5. Most treatments, namely T<sub>0</sub>, T<sub>3</sub>, T<sub>6</sub>, T<sub>7</sub>, T<sub>9</sub>, T<sub>10</sub>, T<sub>12</sub>, T<sub>13</sub>, T<sub>14</sub>, T<sub>16</sub>, T<sub>17</sub>, T<sub>18</sub>, T<sub>19</sub> and T<sub>23</sub> had an increased weight gain up to week 4 and decreased in week 5. Some treatments, namely T<sub>1</sub>, T<sub>5</sub>, T<sub>8</sub> and T<sub>11</sub> had a decrease in weight gain during weeks 4 and 5, while T<sub>2</sub>, T<sub>20</sub>, T<sub>21</sub>, T<sub>22</sub> and T<sub>24</sub> had a constant increase every week. Two treatments, T<sub>11</sub> and T<sub>15</sub> had approximately the same weight gain for weeks 4 and 5. T<sub>22</sub> had a notable increase during week 5, while it was approximately the same for weeks 3 and 4. At the end of five weeks, the body weight and weight gained by chicks in each treatment were not significantly different from each other (Table 3).

Mc Naughton and Day (1978) concluded that iron requirements for hematological and growth responses are critically essential in broiler diets, while Oguz *et al* (2006) found that iron sulphate supplementation had a significant effect on live body weights. Similarly for citric acid, Islam *et al* (2008) reported that the performance of broiler showed significant increase in body weight gain on 0.5% citric acid in broiler diet, when compared with the control. Likewise, Tollba (2010) determined that the effect of citric acid reduced or controlled the prevalence of pathogenic bacteria and parasite in the intestine of broilers; and found that there was significant improvement in body weight gain, among other parameters.

**Table 1: Treatments used in the experiment**

Treatment	Level of supplements or the combinations
T <sub>0</sub>	CONTROL (basal feed with no supplement)
T <sub>1</sub>	60 mg iron
T <sub>2</sub>	80 mg iron
T <sub>3</sub>	100 mg iron
T <sub>4</sub>	120 mg iron
T <sub>5</sub>	0.2% citric acid
T <sub>6</sub>	0.4% citric acid
T <sub>7</sub>	0.6% citric acid
T <sub>8</sub>	0.8% citric acid
T <sub>9</sub>	60 mg iron + 0.2% citric acid
T <sub>10</sub>	60 mg iron + 0.4% citric acid
T <sub>11</sub>	60 mg iron + 0.6% citric acid
T <sub>12</sub>	60 mg iron + 0.8% citric acid
T <sub>13</sub>	80 mg iron + 0.2% citric acid
T <sub>14</sub>	80 mg iron + 0.4% citric acid
T <sub>15</sub>	80 mg iron + 0.6% citric acid
T <sub>16</sub>	80 mg iron + 0.8% citric acid
T <sub>17</sub>	100 mg iron + 0.2% citric acid
T <sub>18</sub>	100 mg iron + 0.4% citric acid

**Table 2: Ingredients and nutrient composition of basal experimental diet**

Ingredients (%)	Broiler starter (0 – 21 days)	Broiler finisher (22 – 35 days)
Maize	60.00	63.00
Ground nut cake	23.35	18.00
Fish meal	13.00	15.00
Mineral mixture	3.00	3.00
Common salt	0.05	0.38
Vitamin A, B <sub>2</sub> , D <sub>3</sub> premix	0.05	0.02
<b>Nutrient composition</b>		
Moisture	6.29	6.22
Crude fibers	5.50	6.00
Total ash	8.02	9.34
Crude protein	22.00	19.00
ME (Kcal/kg)	2900	3000

**Table 3 Mean values of body weight and weight gain of five-week old broiler chicks**

Treatments	Parameters	
	Body Weight at 5 <sup>th</sup> Week (kg)	Weight Gain at 5 <sup>th</sup> Week (kg)
T <sub>0</sub>	1.07	1.03
T <sub>1</sub>	1.18	1.14
T <sub>2</sub>	1.15	1.10
T <sub>3</sub>	1.17	1.13
T <sub>4</sub>	1.14	1.09
T <sub>5</sub>	1.19	1.15
T <sub>6</sub>	1.25	1.20
T <sub>7</sub>	1.17	1.13
T <sub>8</sub>	1.19	1.15
T <sub>9</sub>	1.26	1.21
T <sub>10</sub>	1.25	1.21
T <sub>11</sub>	1.17	1.12
T <sub>12</sub>	1.21	1.17
T <sub>13</sub>	1.14	1.10
T <sub>14</sub>	1.08	1.04
T <sub>15</sub>	1.11	1.07
T <sub>16</sub>	1.13	1.08
T <sub>17</sub>	1.13	1.09
T <sub>18</sub>	1.06	1.02
T <sub>19</sub>	1.05	1.00
T <sub>20</sub>	1.22	1.18
T <sub>21</sub>	1.12	1.08
T <sub>22</sub>	1.16	1.11
T <sub>23</sub>	1.22	1.18
T <sub>24</sub>	0.99	0.94

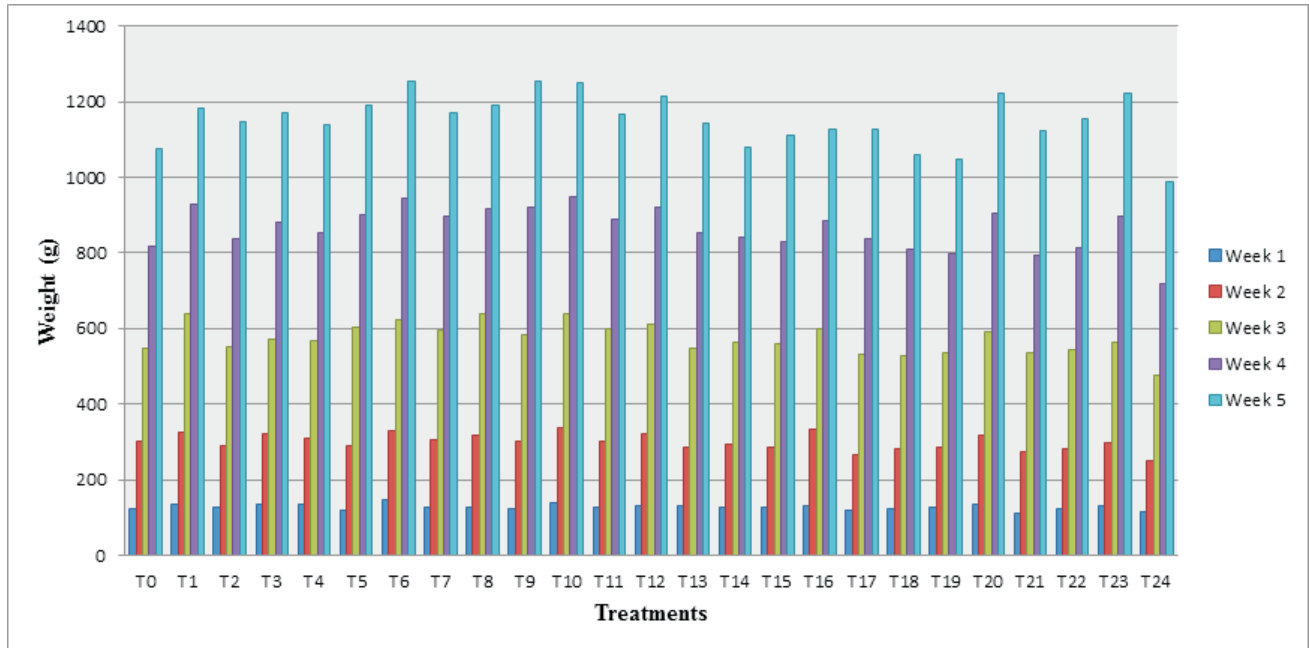


Figure 1 Average body weight of broiler chicks per week in different treatments

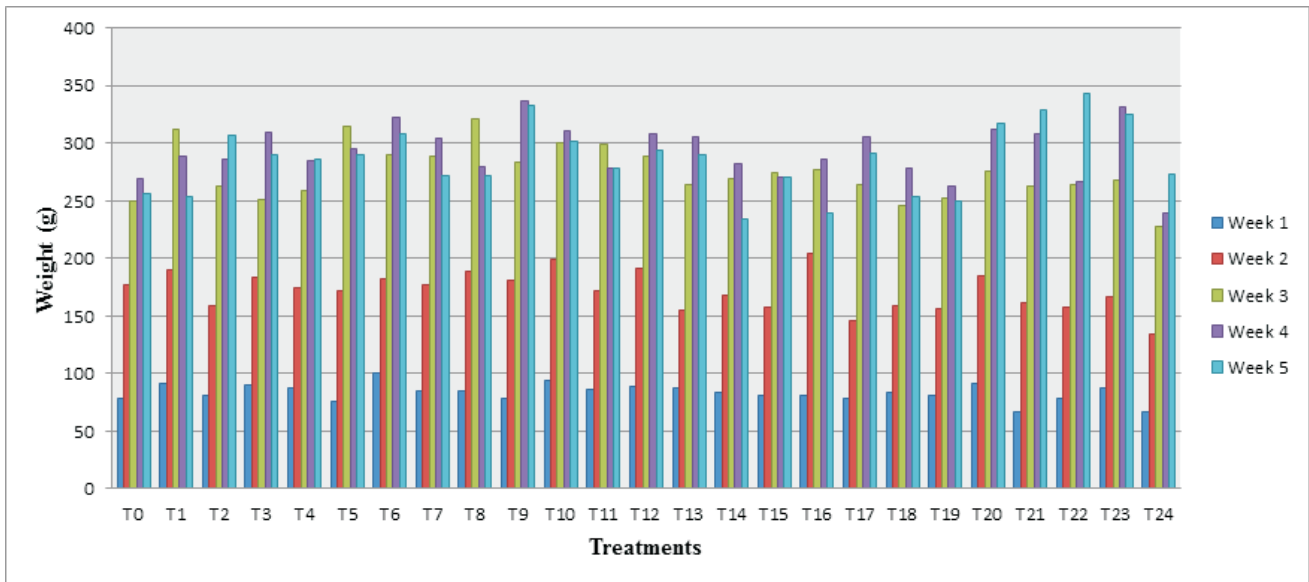


Figure 2 Average weight gain per week of broiler chicks in different treatments

In conclusion, the supplementation of the diets with iron and citric acid allowed a healthy, positive growth performance of the birds, since there was no mortality. Ultimately, these trace elements could be considered as a good option to fortify broiler diets in order for farmers to produce healthy broilers.

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## CURRENT STATUS OF POULTRY AND ITS DIVERSITY IN INDIA

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### ABSTRACT

**As per our livestock census 2012, our country possesses 1<sup>st</sup> rank for buffalo, 2<sup>nd</sup> rank for cattle 2<sup>nd</sup> rank for goat, 3<sup>rd</sup> rank for sheep 4<sup>th</sup> rank for duck duck, 5<sup>th</sup> rank for poultry and 6<sup>th</sup> rank for camel population in the world. Poultry include 692. 65 million fowls, 23.54 million ducks and 13.03 million turkey, quails and other poultry species (Shubhanshu, 2015).**

### Eggs and chicken

Poultry production in India emerged in last four decades from our unscientific practice to commercial production system with state-of-the-art technological interventions. The egg productions in 2006-07 was 50.7 billion number as compared to 66.45 billion in 2011-12. The egg production at the beginning of 12<sup>th</sup> five year plan (2012-13) is 69.73 billion with at annual growth rate 4.94%. The current per capita availability is around 57 eggs per year during

2012-13.

The fowl is the major poultry species for the egg production sharing 94.14 % of the total egg produced in the country. The biggest state in terms of fowl egg production is Andhra Pradesh (33.92%) followed by Tamil Nadu (18.18%), Maharastra (6.96%), Haryana (6.45%), Punjab (5.78%), Karnataka 5.6% and West Bangal (5.17%). These top seven states of the country , cater the need of egg in different parts of India as they contribute more than 82% of the total egg produced in India. As far as the egg production from the duck is concerned, West Bangal state alone contribute 68.33% of the total egg produced in our country. The Kerala and Assam produced 9.3% and 7.37% of the total duck's egg of the country. Other state which also contribute to the duck egg production include Jharkhand, Tripura, J&K, Bihar, U.P. Manipur, Odhisha, Chandigarh, A&N Island , Maghalaya & Lakshdweep.

**Table-1 Trends of Egg Production in India**

Year	1950-51	1960-61	1968-69	1980-81	1990-91	2000-01	2010-11	2012-13
Eggs million nos	1832	2881	5300	10060	21101	36632	63024	69731

Total meat production in 2012-13 in our country was 5.95 million tons. The annual growth rate for production of meat was 7.87% in 2012-13. Cattle, buffalo, sheep, goat, pig and poultry contributed annual meat production of 3.27, 11.04, 4.41, 9.41, 4.53, and 26.82 lakh tones respectively during 2012-13. This indicated that poultry is maximally contribution (45.08%) in the meat production in India. Other species producing meat include buffalo (18.56%), goat (15.82%), pig (7.62%), sheep (7.42%), and cattle (5.5%).

**Table-2 Annual growth rate in egg production**

Period	Growth rate in egg production (%)
1950-51 to 1960-61	4.63
1960-61 to 1973-74	7.91
1973-74 to 1980-81	3.79
1980-81 to 1990-91	7.69
1990-91 to 2000-01	5.67
2000-01 to 2010-11	5.58

### **Poultry Diversity in India**

The poultry population in India has grown approx. nine times during last 6 decades. The total poultry population in India in 1951 was 73.5 million, which become 729.21 million in 2012. As per livestock census (2012) 94.98% of the poultry population is domestic chicken (fowl) followed by duck population 3.29%. Per capita availability of eggs was 5 in 1951 which is increased upto 55 in 2012.

### **Domestic chicken (Fowl)**

Presently more than 196.24 million chicken are reared in the backyard poultry production system. In this system, indigenous poultry breeds as well as genetically improved strains are reared. A total of 15 breeds of fowl

have been registered by N.B.A.G.R. which includes Ankleshwar, Aseel, Bursa, Chittagong, Danki, Daothigir, Ghagus, Harringhata Black, Kadaknath, Kalasthi, Kashmir Favorolla, Niri, Nicobari, Punjab Brown, and Tellichery.

Some cross-bred strains of fowl have also been developed for rural poultry production system. Some of these are Giriraja, Vanraja, Krishna J, Yammuna, Kalinga Brown, Dhanraja, Mirtuanjaya, CARI Gold, Debendra, Nanda Naam-I, Girrani, Athula, Gramlakhsmi, Gram priya etc. (Majum Lal nad Garg, 2007)

A total of 496.41 million layers are broilers and kept at different organized farm

under intensive production system. The commercial chicken reared in India are strains/lines involving white leg Horn, New Hampshire, Cornish, Barred Plymouth Rock, Rhode Island Red and Black Australorp. The FAO list of poultry breeds include 30 chicken breeds in India and 6 exotic ones.

### **Duck**

Ducks are also kept either in backyard production system or at organized farm. Majority of Indian Ducks (18.59 million) are kept under backyard system and about 4.94 million are kept at organized farms. In the FAO list, six duck breeds namely, Indian Runner, Khaki Campbell, Chemballi, Kuttanadu chara, Nageshwari, and Synthetemetete.

### **Quails and Turkey.**

Japanese quails are domesticated in India. Indian sub species of quail i.e. Rain, Grey and Button quail collectively known as Bater. Present quail population in India is 0.26 millions. The current population of Turkey in India is 0.32 million, but as such, no specific turkey breeds of Indian origin has been reported.

### **CONCLUSION**

Poultry sector emerged commonly in the world since last six decades. More than hundred breeds of poultry in the world including 30 Indian Chickenbred are found. (Nesheim. et.al., 1979). As per above discussion our country are most diverse in poultry sector.

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purpose of seedbedding plants studies have found  
Abdellahim Amer, Areebi Ahuras and Negrin  
Department of Animal Husbandry, SLAETS, A  
Society of Veterinary Sciences and Medicine,  
Syria, Sevintythree (75) Jordan Road, Deir Ezzor  
Road, P.O. Box 906, Hama, Syria.  
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Several other plants with stemmatical and/or woody parts (the tree) were more common in the species, including sunn hemp (*Crotalaria retusa*), respectively, (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19), (20), (21), (22), (23), (24), (25), (26), (27), (28), (29), (30), (31), (32), (33), (34), (35), (36), (37), (38), (39), (40), (41), (42), (43), (44), (45), (46), (47), (48), (49), (50), (51), (52), (53), (54), (55), (56), (57), (58), (59), (60), (61), (62), (63), (64), (65), (66), (67), (68), (69), (70), (71), (72), (73), (74), (75), (76), (77), (78), (79), (80), (81), (82), (83), (84), (85), (86), (87), (88), (89), (90), (91), (92), (93), (94), (95), (96), (97), (98), (99), (100), (101), (102), (103), (104), (105), (106), (107), (108), (109), (110), (111), (112), (113), (114), (115), (116), (117), (118), (119), (120), (121), (122), (123), (124), (125), (126), (127), (128), (129), (130), (131), (132), (133), (134), (135), (136), (137), (138), 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# MATERIALS AND METHODS