**Table1. Phytochemical Screening of** *Terminalia arjuna* **extract :**

| S.No. | Tests | Result |
|---|---|---|
| 1 | Test for Carbohydrate | + |
| 2 | Test for Alkaloids | + |
| 3 | Test for Glycosides | + |
| 4 | Test for Steroids | + |
| 5 | Test for Flavanoids | + |
| 5 | Test for Saponins | + |
| 7 | Test for Tanins | + |
| 8 | Test for anthraquinones | + |
| 9 | Test for phlobatannins | + |
| 10 | Test for Terpenoids | + |

These values are compared with Ascorbic acid, which is used as positive control. The IC 50 values of Ascorbic acid and of *T. arjuna* extract was found to be 50 µg/ml and 70 µg/ml, respectively.

**Table No.2.--**$IC_{50}$ Value

| S. No. | Group | Concentration | $IC_{50}$ value |
|---|---|---|---|
| 1. | *T.arjuna* bark extract | 70 µg/ml | 50.27 |
| 2. | Ascorbic acid | 50 µg/ml | 51.55 |
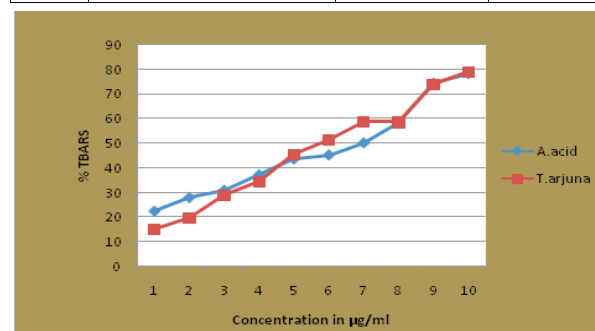


**Graph 1: showing antioxidant activity of Terminalia arjuna**

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## *CONTENTS*

presence of free anthraquinones.

(b) 3 ml of the aqueous extract was boiled with 3mlof aqueous sulphuric acid and filtered while hot. 3 ml of benzene was added to the filtered and shaken. The benzene layer was separated and 3 ml of 10% HN3 added. A pink, red or violet colouration in the ammonical (lower) phase indicates the presence of anthraquinones derivatives.

**Test for terpenoids**

2ml of the organic extract was dissolved in 2 ml of chloroform and evaporated to dryness. 2 ml of concentrated sulphuric acid was then added and heated for about 2 min. A grayish colour indicates the presence of terpenoids.

**Tests for steroids**

(I) A red colour produced in the lower chloroform layer when 2 ml of the extract dissolved in 2 ml of chloroform and 2 ml concentrate sulphuric acid added in test tube indicates the presence of steroids.

(ii) The development of a greenish colour when 2 ml of the organic extract was dissolved in 2 ml of chloroform and treated with sulphuric and acetic acids

**2.2 Antioxidant Activity**

Antioxidant Activity of *Terminallia arjuna* extract was determined using Fenton reaction (*in-vitro*). Fenton's reaction was used for determination of *in vitro* antioxidant activity. The hydroxyl radical attached deoxyribose and initiated a series of reaction that eventually resulted in the formation of thiobarbituric acid reaction substance (TBARS). the measurement of TBARS thus gives an index of free radical scavenging activity. The absorbance was measured at 532 nm. Ascorbic acid was used as positive control.

The results are expressed as the percentage inhibition of TBARS.

**3.1 Phytochemical study:**

Phytochemical screening of T.arjuna showed presence of different chemical active constituent, such as Alkaloids, anthraquinones, tannin, Saponins, Carbohydrates, Phytosterol, Flavanoids, Glycosides, phlobatannins, terpenoids

**3.2 *In vitro* Antioxidant activity**
*In vitro* antioxidant activity of *T. arjuna* extract by Fenton Assay

The free radical scavenging capacity of the ethanolic extracts of *T. arjuna* extract was determined using TBARS method and the data was furnished in Table . The stock solution of *T. arjuna* extract was prepared at the concentration of 10 mg/ml. Extent of hydroxyl radical scavenged was determined by decreased intensity of pink coloured chromophore in the form of IC 50 values which was determined at 532 nm. Lower IC 50 value represent higher antioxidant activity. The dose dependent inhibition of TBARS formation at the different concentration of *T. arjuna* extract ranging from 100 µg/ml to 1,000 µg/ml.

**RESULTS AND DISCUSSION**

Phytochemical Screeening of the plants showed the presence of alkoloids, glycoloids, proteins, flavonoids, terpenoids, saponins, tannins, anthraquinones, phenols and reducing sugars. The IC50 values of T. arjuna extract was found to be 70 µg/ml.

*T. arjuna* showed potent inhibition of free redical scavenging activity. The free redical scavenging (antioxidant) activities of the plant probably contribute to the effectivness of the in various therapy.

increasing antioxidative defense activities (Manna et al., 2006). Its chemical constituents act as a gastro-protective agent (Devi et al., 2007). Different types of bioactive compound have been isolated from this medicinal plant possesses enormous value in medicine among then arjunolic acid is very well known. The aim of the present study was to deliver the literal studies of T. arjuna with its phytochemical and pharmacological characteristics.

## MATERIALS AND METHODS

### 2.1 Phytochemical Screening:

Phytochemical screening for alkaloids, steroids, triterpenoids, glycosides, carbohydrates, flavanoids, tannins, phlobatannins, antiquinones and saponins were carried out as described below (Sofowora, 1993; Ogbuewu, 2008).

### Test for alkaloids

3ml of aqueous extract was stirred with 3 ml of 1% HCl on a steam bath. Mayer's and Wagner's reagents were then added to the mixture. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids.

### Tests for carbohydrates

(a) Molisch's test: 3 ml of the aqueous extract was added to 2 ml of Molisch's reagent and the resulting mixture shaken properly, then 2 ml of concentrated H2SO4 was poured carefully down the side of the test tube. A violet ring at the interphone indicates the presence of carbohydrate.

(b) 3 ml of the aqueous extract was measured into test tube and 1 ml of iodine solution was added. A purple coloration at the interphone indicates the presence of carbohydrates.

### Tests for Glycosides

### (a) Liebermann's test

2 ml of the organic extract was dissolved in 2 ml of chloroform, where 2 ml of acetic acid was added carefully. A color change from violet to blue to green indicates the presence of a steroidal nucleus (i.e. a glycone portion of glycoside.)

### (b) Salkowski's test

2 ml of each extract was dissolved in 2 ml of chloroform.2 ml of sulphuric acid was added carefully and shaken gently. A reddish brown colour indicates the presence of a steroidal ring (i.e., a glycone portion of glycoside).

### Test for tannins

About 2ml of the aqueous extract was stirred with 2ml of distilled water and few drops of FeCl3 solution (5%w/v) were added. The formation of a green precipitate was an indication for the presence of tannins.

### Test of saponins

5ml of aqueous extract was shaken vigorously with 5ml of distilled water in a test tube and warmed. The formation of stable foam, honey comb in shapes, was taken as an indication for presence of saponins.

### Test for phlobatannins

About 2ml of aqueous extract was added to 2ml of 1%HCl and the mixture was boiled. Deposition of a red precipitate was taken as an evidence for the presence of phlobatannins.

### Test for flavonoids

To 1ml of aqueous extract, 1ml of 10% lead acetate solution was added. The formation of a yellow precipitat was taken as a positive test for flavonoids.

### Tests for anthraquinones

(a) Borntrager's test: 3ml of aqueous extract was shaken with 3 ml of benzene, filtered and 5 ml of 10% ammonia solution was added to the filtrate. The mixture was shaken and the presence of a pink, red or violet color in the ammonical (lower) phase indicates the

# ACCUMULATION AND UPTAKE OF HEAVY METALS (Cd, Pb AND Zn) IN VEGETABLE CROPS GROWN IN SEWAGE CONTAMINATED SOILS

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## ABSTRACT

Consumption of vegetable crops contaminated with heavy metals is a major food chain route for human exposure. In the present study, vegetables grown in the sewage and tap water irrigation are *Coriandrum sativum* L, *Raphanus sativus* and *Daucus carrota*. Accumulation of heavy metals(Cd, Pb and Zn) was significantly higher in 100% sewage irrigated soil at all the four depths (0-15, 15-30, 30-45 and 45-60 cm), respectively. Cadmium, Lead and Zinc accumulation are higher at the surface horizons and it decreases sharply with depth in both tap and sewage irrigated soils. Extent of heavy metal built up in sewage irrigated soils was significant in both 0-15 and 15-30 cm depth. Higher uptake of Cd, Pb and Zn, were observed in the edible parts of all crops grown in 100% sewage water irrigated soils ($T_9$) compared to that of crops grown on 100% tap water irrigated soils ($T_1$). Sewage water irrigation has a great potential to contaminate the soil which may lead to the uptake of heavy metals in crop plants and may cause harmful effect on animals and plants. Results indicate that long term and indiscriminate application of sewage water, which contains heavy metals may cause accumulation of heavy metals in surface and sub-surface soils and the build-up of heavy metals on soil profile may prove harmful not only to plants, but also to consumers of the harvested crops.

*Key words :* Vegetable crops, heavy metals, sewage water, tap water

Pollution of the biosphere by toxic metals has accelerated severely since the beginning of the industrial revolution. The primary sources of metal pollution include the burning of fossils fuels, mining and smelting of metaliferous ores, municipal wastes, fertilizers, pesticides, and waste water irrigation. Contamination of groundwater and soil by heavy metals leads to major environmental and human health problems. Plant metabolism is also affected negatively by the heavy metals (Singh and Agrawal, 2010).The use of sewage water for different purposes is one of the most important strategic alternatives for renewable water in many countries of the world, especially those that suffer from a shortage of traditional water resources. The use of sewage water in agriculture provides water, N and P, as well as organic matter to the soils, but there is a concern about the accumulation of potentially toxic elements such as Cd, Pb, Cu, Fe, Zn and Mn from both domestic and industrial sources (Devkota and Schmidt, 2000; Sharma et al., 2006 ). Heavy metals can also accumulate in the soil at toxic levels as a result of long-term

application of untreated and treated wastewaters. Soils irrigated by sewage water accumulate heavy metals such as Cd, Pb, Zn, Cr, Ni, etc in surface soil. When the capacity of the soil to retain heavy metals is reduced due to repeated application of sewage water, heavy metals leaching to ground water or soil solution available for plant uptake. For the metals derived from anthropogenic sources, this can strongly influence their speciation and hence bioavailability (Singh and Aggarwal 2006).

Heavy metals may enter the human body through inhalation of dust,consumption of contaminated drinking water, direct ingestion of soil and consumption of food plantsgrown in metal-contaminated soil (Cambra et al., 1999; Dudka and Miller, 1999). Food and water are the main sources of our essential metals; theseare also the media through which we are exposed to various toxic metals. Heavy metals are easilyaccumulated in the edible parts of plants (Itanna, 2002). Vegetables constitute an important part of the human diet sincethey contain proteins, vitamins, as well as carbohydrates, minerals, and trace elements. It is known thatserious systemic health problems can develop as a result of excessive accumulation of dietary heavy metalssuch as Cd, Cr, and Pb in the human body [Codex Alimentarius Commission (FAO/WHO), 2001]. High concentrations of heavy metals (Cu, Cd and Pb) in fruitsand vegetables were related to high prevalence of upper gastro interestinal cancer (Itanna, 2002). The main objectives of this study were to determine the depth wise accumulation of Cd, Pb and Zn in sewage contaminated soilsand uptake of heavy metals (Cd, Pb and Zn) bysome vegetables (*Coriandrum sativum L, Raphanus sativus* and *Daucus carrota*) collected from Experimental Farm of Sheila Dhar Institute Allahabad irrigated with sewage and tap water.

## MATERIALS AND METHODS
### Experimental Site

The experimental site is situated in northern India at 25º57'N latitude and 81º50'E longitude on south-east facing slopes of comparable inclination at altitudes between 200 and 80 m above sea level. A sandy clay loam soil, derived from sewage-sludge irrigated Indo-Gangetic alluvial soils of SDI farm situated on the confluence of Ganga and Yamuna alluvial deposit, was sampled from Allahabad city, India. The properties of the soil were: pH 7.8, EC 0.28 $dSm^{-1}$, organic matter ($K_2Cr_2O_7$ oxidation) 5.6 g $kg^{-1}$, total N 0.08 %, total P 0.04 %, CEC 19.8 C mol (P) $kg^{-1}$,total Cd 0.56 mg $kg^{-1}$, total Pb 2.24 mg $kg^{-1}$ and total Zn 12.38 mg $kg^{-1}$. The texture comprised of sand (>0.2 mm) 56.0 %, silt (0.002–0.2 mm) 20.0 % and clay (<0.002 mm) 24.0 %.

### Soil sampling and extraction of heavy metals from soil

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. For total Cd, Zn and Pb content, one gram of soil was mixed in 5 ml of $HNO_3$ (16M, 71%) and 5 ml of $HClO_4$ (11

# ANALYSIS OF PHYTOCONSTITUENT AND ANTIOXIDANT ACTIVITY OF *TERMINALIA ARJUNA* BARK EXTRACT

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### ABSTRACT

**Phytochemical screening of the plants showed the presence of alkaloids, glycoloids, proteins, flavonoids, terpenoids, saponins, tannins, anthraquinones, phenols and reducing sugars. The IC 50 values of *T. arjuna* extract was found to be 70 µg/ml.**

***Key words*:** T.arjuna, Phytoconstituent, Antioxidants, Fentons reaction, Oxidative stress.

The plants that possess therapeutic properties or exert beneficial pharmacological effects on the animal body are generally designated as medicinal plants. In most of the traditional systems of treatment, the use of medicinal plant include the fresh or dried part, whole, chopped, powdered or an advanced form of the plant usually made through extraction with different solvents play a major role and constitute the backbone of the traditional medicine. Botanical medicines or phytomedicines refer to the use of seeds, berries, leaves, bark, root or flowers of any plant for medicinal purposes by significant number of people (Barret et al., 1999). Although there are no apparent morphological characteristics in the medicinal plants growing with them, yet they possess some special qualities or virtues that make them medicinally important. It has now been established that the plants which naturally synthesis and accumulate some secondary metabolites, like alkaloids, glycosides, tannins, volatiles oils and contain minerals and vitamins, possess medicinal properties (Ghani, 2003). Accordingly, the World Health Organization (WHO) consultative group on medicinal plants has formulated a definition of medicinal plants in the following way: "A medicinal plant is any plant which, in one or more of its organ, contains substance that can be used for therapeutic purpose or which is a precursor for synthesis of useful drugs" (Goldstein, 1974).

Terminalia arjuna is a native Bangladeshi tree with simple leaf, smooth and thick bark belonging to the family Combretaceae. Flowers are small, regular, sessile, cup-shaped, polygamous, white, creamy or greenish-white and robustly honey-scented and flowering from April to July. The inflorescences are short axillary spikes or small terminal panicles and fruits are obovoid-oblong, dark brown to reddish brown fibrous woody, indehiscent drupe and ripening from February to May ( Bhat et al., 2003). All the parts of the plant have been used for their therapeutic beneficiary effect from ancient times. T. arjuna helps to maintain a healthy heart and decrease the effects of stress and anxiety (Emran et al., 2011). It has antibacterial (Perumalsamy et al., 1998), antimutagenic, hypolipidemic, antioxidant and hypocholesterolaemic and anti-inflammatory effects . T. arjuna have the capability to protect the liver and kidney tissues against CCl4-induced oxidative stress by

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M, 71%). The composite was heated up to dryness. The volume was made up to 50 ml with hot distilled water. The clean filtrate was used for the estimation of heavy metals (Cd, Zn and Pb) by Atomic Absorption Spectrophotometer (AAS) (AAnalyst600, Perkin Elmer Inc., MA, USA).

## 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). 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 (Kumar and Mani 2010), and total phosphorus by hot plate digestion with $HNO_3$ (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 (harvesting stage). Samples were carefully rinsed with tap water followed by 0.2 % detergent solution, 0.1N HCl, de-ionized water, and double distilled water.

Later samples were dried in a hot-air oven at a temperature of 45ºC, 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. $HNO_3$(16M, 71%), $H_2SO_4$ (18M, 96%) and $HClO_4$ (11M, 71%) in 5:1:2), heated on hot plate at low heat (60ºC) for 30 minutes and total heavy metals were determined by the aforesaid Spectrophotometer.

## Sampling and analysis of sewage water and tap water

Composite sample of waste water were collected from sewage channel carrying sewage mixed with untreated industrial effluents. Manual sampling from sewage surface was carried out by plastic bottle fastened by a rope. Container was rinsed twice with the sample to be examined before being finally filled. 2000 ml of sewage sample was collected in polyethylene bottle rinsed with 20% $HNO_3$ followed by distilled water. Water samples from tap water were also collected. High grade plastic bottles of 2000 ml capacity were thoroughly cleaned and were rinsed with the water being sampled. Samples were collected after running the water for 15 min from the source so as to avoid error due to water contained within the pipes. 100 ml of the thoroughly mixed sewage water sample was transferred to a 250-ml beaker. 100 ml sewage water sample was evaporated to dryness on steam bath and digested with 5 ml of perchloric acid ($HClO_4$) and 25 ml nitric acid ($HNO_3$) mixture (1 : 4) on hot plate to the lowest volume (15-20 ml). Each digest was made up to 50 ml with the addition of double distilled water (APHA, 2005; Lone et al.,2013). Cd, Pb and Zn (Table-1), were determined in the digest by

| Content | Sewage Water | Tap Water |
|---|---|---|
| pH | 7.82 | 8.0 |
| Cd (mg L$^{-1}$) | 3.24 | ND |
| Pb (mg L$^{-1}$) | 5.56 | 0.014 |
| Zn (mg L$^{-1}$) | 6.71 | 0.021 |

AAS (Atomic Absorption spectrophotometer).

**Experimental**

After systematic survey factorial experiment was conducted to study the accumulation and uptake of heavy metals in vegetable crops grown in sewage contaminated soils. 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. Vegetables were harvested at 60 days after sowing (DAS). *Coriandrum sativum L, Raphanus sativus* and *Daucus carrota* was grown successively in the 27 plots (each of 1m$^2$ in area). The treatment combinations were as follows:

T$_1$= Tap Water 100%, T$_2$= Tap Water 80% + Sewage Water 20%,T$_3$= Tap Water 70% + Sewage Water 30%,T$_4$= Tap Water 60% + Sewage Water 40%,T$_5$= Tap Water 50% + Sewage Water 50%,T$_6$= Tap Water 40% + Sewage Water 60%,T$_7$= Tap Water 30% + Sewage Water 70%,T$_8$= Tap Water 20% + Sewage Water 80%,T$_9$= Sewage Water 100%.

**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$_{diff}$. × t$_{5\%}$ (t$_{5\%}$= 2.042 at DF$_{error}$= 30 was observed) and standard deviation (Syx) were determined in accordance with Motulsky and Christopoulos (2003). MS-Excel 2010 software was used for drawing figures.

**RESULTS AND DISCUSSION**

**Accumulation of heavy metals (Cd, Pb and Zn) in sewage contaminated soils**

The extent of contamination due to anthropogenic activity is generally judged by making comparisons of the metal contaminated soils with adjacent non-polluted ones as there is no direct reference level due to wide variations in naturally occurring heavy metals in soils. Same criteria have been followed in present study to determine the distribution and extent of heavy metal pollution in sewage irrigated soil as compared to tap water irrigated soils. Data on Cd, Pb and Zn in soils are presented in Table 2 to 4. Concentration of these metals in sewage and tap water irrigated soils varied markedly.

**Table.3. Showing perception of respondents (N=252)**

| QUESTIONS | Do Not Agree | Moderately agree | Mostly agree | Strongly Agree |
|---|---|---|---|---|
| Women's suggestions are accepted in family during purchase of house hold items | 1 | 6 | 94 | 151 |
|  | 0.40 | 2.38 | 37.30 | 59.92 |
| women's suggestions are considered during purchase of cow, heifer | 0 | 7 | 107 | 138 |
|  | 0.00 | 2.78 | 42.46 | 54.76 |
| women's suggestions are considered in VDCs | 4 | 29 | 97 | 122 |
|  | 1.59 | 11.51 | 38.49 | 48.41 |
| Women believe, they can bring changes in society | 8 | 5 | 127 | 112 |
|  | 3.17 | 1.98 | 50.40 | 44.44 |
| Women believe, they can learn new skills | 23 | 17 | 90 | 122 |
|  | 9.13 | 6.75 | 35.71 | 48.41 |
| Women raise their issues in group meeting | 14 | 16 | 110 | 112 |
|  | 5.56 | 6.35 | 43.65 | 44.44 |
| Women participate in developmental activities of village | 9 | 26 | 111 | 106 |
|  | 3.57 | 10.32 | 44.05 | 42.06 |
| Women address their issues effectively at Govt. offices | 21 | 52 | 94 | 85 |
|  | 8.33 | 20.63 | 37.30 | 33.73 |
| Women believe, they have enough potential | 2 | 19 | 131 | 100 |
|  | 0.79 | 7.54 | 51.98 | 39.68 |
| Women's knowledge of DH increased | 0 | 8 | 86 | 158 |
|  | 0.00 | 3.17 | 34.13 | 62.70 |
| Women are better informed regarding Govt. welfare schemes | 2 | 10 | 120 | 120 |
|  | 0.79 | 3.97 | 47.62 | 47.62 |
| Women are better informed regarding educational opportunities | 1 | 14 | 105 | 132 |
|  | 0.40 | 5.56 | 41.67 | 52.38 |
| Women needs are increased | 0 | 5 | 126 | 121 |
|  | 0.00 | 1.98 | 50.00 | 48.02 |
| Women empowerment has taken place | 0 | 18 | 115 | 119 |
|  | 0.00 | 7.14 | 45.63 | 47.22 |

**(1) D.H. = Dairy Husbandry, (2) FGD = Focus Group Husbandry, (3) VDCS = Village Dairy Cooperatives**

**Table 1: Value of coefficients of fitted regression model Coefficients**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| Constant ($\beta_0$) | 2.749 | .314 | | 8.744 | .00 |
| LN(Monthly_Income) ($\beta_1$) | .075 | .038 | .124 | 1.981 | .04 |

a. Dependent Variable: Women Empowerment

of each participant were averaged to form empowerment index.

Empowerment index (response variable) was then regressed over natural log transformed monthly income. That is, empowerment index is dependent variable and natural log transformed monthly income is the independent variable. Analysis was conducted using SPSS-21.The fitted model is :

**Women Empowerment = 2.749 + 0.075 LN (monthly income)**

From the statistical analysis, the estimated relationship between income and empowerment is as per the fitted regression model. There is significant evidence to reject null hypothesis indicating income is positively associated with women empowerment [Regression, $\beta_1$ = 0.075, T = 1.981, p-value = 0.04]. The association between income and women empowerment has positive direction and the relationship is: with every one unit increase in log income women empowerment increases by 0.075 units [Regression, $\beta_1$ = 0.075, T = 1.981, p-value = 0.04].

**CONCLUSION**

Dairy co-operatives operate at the grass-roots and the model brings income and employment opportunity for women at the village level. The study finds that being a member of dairy co-operative not only impacts the functional aspects of business but it significantly affects the latent construct of empowerment by making women feel more empowered than those not involved. The research finds that an income generated from participation in dairy business is associated with empowerment at home, high participation in village environment and most importantly it increases individual level empowerment. Future research can look into the causal link for what specific attribute leads to change in objective and felt empowerment of women.

**Table.2. Demographic profile and general information of respondents.**

| Particulars | I | II | III | IV |
|---|---|---|---|---|
| Age | <30 | 31-40 | 41-50 | >51 |
| No.s / % | 72 / 28.57 | 101 / 40.08 | 58 /23.02 | 21 / 8.33 |
| Category/Caste | BPL | APL | ST | SC |
| No.s / % | 199 /78.97 | 53/21.03 | 247 /98.02 | 5/1.98 |
| Land Acres | Nil | Up to 2 | 2.1 -4.0 | >4.1 |
| No.s / % | 12 / 4.76 | 80 /31.75 | 99 / 39.28 | 61 / 24.21 |
| Education | Illiterate | Primary | Highschool | Graduate |
| No.s / % | 101 /40.08 | 102/39.65 | 49/19.44 | 0/0 |
| Marital Status | Married | Unmarried | Divorcee | Widow |
| No.s / % | 239 / 94.84 | 4/ 1.59 | 1 / 0.4 | 8 /3.17 |

**Cadmium**

The application of 100% sewage water ($T_9$) increased maximum Cd accumulation in 0-15, 15-30, 30-45 and 45-60cm depth soils from 1.25 mg kg$^{-1}$, 0.74 mg kg$^{-1}$, 0.56 mg kg$^{-1}$ and 0.42 mg kg$^{-1}$, respectively (Table-2). The application of 100% tap water ($T_1$) increased minimum Cd accumulation in 0-15, 15-30, 30-45 and 45-60cm depth soils from 0.18 mg kg$^{-1}$, 0.14 mg kg$^{-1}$, 0.06 mg kg$^{-1}$ and 0.04 mg kg$^{-1}$, respectively. Similar result was found by Lone et al. (2013). Mitra and Gupta (1999) and Khurana et al. (2004) also reported higher concentration of heavy metals in sewage irrigated soils than soil irrigated with uncontaminated water.

**Table-2. Depth wise accumulation of Cadmium in sewage and tap water irrigated soil**

| Treatment | Cadmium accumulation in mg kg$^{-1}$ | | | |
|---|---|---|---|---|
| | Depth of sampling (cm.) | | | |
| | 0-15 | 15-30 | 30-45 | 45-60 |
| $T_1$ | 0.18 | 0.14 | 0.06 | 0.04 |
| $T_2$ | 0.23 | 0.16 | 0.09 | 0.08 |
| $T_3$ | 0.35 | 0.32 | 0.19 | 0.15 |
| $T_4$ | 0.45 | 0.52 | 0.22 | 0.24 |
| $T_5$ | 0.58 | 0.46 | 0.33 | 0.21 |
| $T_6$ | 0.62 | 0.49 | 0.32 | 0.2 |
| $T_7$ | 0.78 | 0.35 | 0.45 | 0.31 |
| $T_8$ | 0.96 | 0.66 | 0.26 | 0.34 |
| $T_9$ | 1.25 | 0.74 | 0.56 | 0.42 |
| SE | 0.08 | 0.06 | 0.0219 | 0.05 |
| CD | 0.17 | 0.13 | 0.0464 | 0.11 |

**Table-3. Depth wise accumulation of Lead in sewage and tap water irrigated soil**

| Treatment | Lead accumulation in mg kg$^{-1}$ | | | |
|---|---|---|---|---|
| | Depth of sampling (cm.) | | | |
| | 0-15 | 15-30 | 30-45 | 45-60 |
| $T_1$ | 1.85 | 1.24 | 0.86 | 0.65 |
| $T_2$ | 4.56 | 2.34 | 0.98 | 0.76 |
| $T_3$ | 5.25 | 1.45 | 1.12 | 0.86 |
| $T_4$ | 6.65 | 3.62 | 2.45 | 1.32 |
| $T_5$ | 7.56 | 2.67 | 2.76 | 1.22 |
| $T_6$ | 8.45 | 4.86 | 3.32 | 1.65 |
| $T_7$ | 9.86 | 5.43 | 3.67 | 2.56 |
| $T_8$ | 11.73 | 6.87 | 5.53 | 2.34 |
| $T_9$ | 13.62 | 8.48 | 5.78 | 3.24 |
| SE | 0.37 | 0.18 | 0.17 | 0.07 |
| CD | 0.78 | 0.38 | 0.36 | 0.16 |

**Lead**

A perusal of the data presented in Table 3 indicate that, concentration of Pb was higher in sewage irrigated soils than in tap water irrigated soils at all the four depths (0-15, 15-30, 30-45 and 45–60 cm).The application of 100% sewage water ($T_9$) increased maximum Pb accumulation in 0-15, 15-30, 30-45 and 45-60 cm depth soils from 13.62 mg kg$^{-1}$, 8.48 mg kg$^{-1}$, 5.78 mg kg$^{-1}$ and 3.24 mg kg$^{-1}$, respectively. The application of 100% tap water ($T_1$) increased minimum Pb accumulation in 0-15, 15-30, 30-45 and 45-60 cm depth soils from 1.85 mg kg$^{-1}$, 1.24 mg kg$^{-1}$, 0.86 mg kg$^{-1}$ and 0.65 mg kg$^{-1}$, respectively. Similar result was foundby Lone et al. (2013).The extent of lead built up in sewage irrigated soils was significant in both 0-15 and 15-30 cm depth. This might be due to the fact that, concentration of heavy metals in sewage effluents emanating from different sources is manifolds higher than that of tap water. A gradual decline in its concentration was recorded with increase in distance from the point of sewage discharge and down the profiles. Data further indicate that the enrichment of Pb due to discharge of sewage water and sludge mostly in the surface layer with very little mobility down the profile. Datta et al. (2000) reported that, soils of IARI farm receiving sewage water of mostly domestic origin for more than three decades has only marginally increased the concentration of Pb from 1.2 to 1.6 mg kg$^{-1}$ soil. These results are also in tune with Mosleh and Almagrabi (2013) who reported that high level of Zn and Pb was found in soils (11.24 and 8.32 mg kg$^{-1}$) respectively.

**Table- 4. Depth wise accumulation of Zinc in sewage and tap water irrigated soil**

| Treatment | Zinc accumulation in mg kg$^{-1}$ | | | |
|---|---|---|---|---|
| | Depth of sampling (cm.) | | | |
| | 0-15 | 15-30 | 30-45 | 45-60 |
| $T_1$ | 11.45 | 8.49 | 5.58 | 4.34 |
| $T_2$ | 14.24 | 9.22 | 6.23 | 5.26 |
| $T_3$ | 16.38 | 9.68 | 7.12 | 6.56 |
| $T_4$ | 17.89 | 10.23 | 7.78 | 5.45 |
| $T_5$ | 18.27 | 11.68 | 8.65 | 6.89 |
| $T_6$ | 19.45 | 12.24 | 8.76 | 7.36 |
| $T_7$ | 22.67 | 18.34 | 11.56 | 6.87 |
| $T_8$ | 24.56 | 18.22 | 12.45 | 7.45 |
| $T_9$ | 26.47 | 19.48 | 13.56 | 7.87 |
| SE | 0.58 | 0.14 | 0.23 | 0.22 |
| CD | 1.24 | 0.29 | 0.49 | 0.47 |

on women empowerment.

$H_a$: Income through dairy business has effect on women empowerment.

**MATERIALS AND METHODS**

**Location of Study**

Dangs is located in southern Gujarat (India) and is the smallest district having only three Talukas; with three hundred eleven villages. According to the 2011 census,226,769 people reside in Dangs with a population density of 129 inhabitants per square kilometer. Sex ratio is 1007 females for every 1000 males as compared to country's 940. 33% of the geographical area is under cultivation in the district out of the total geographical area of 1.7 lakhs hectares. 59% of the district area is covered by forest and only 1% of the area is waste land. The biggest challenge of Dangs is that the terrain is hilly and only 18% of the land gets irrigation which leads to poor agriculture sector along with less income resulting in high level of seasonal migration of tribals as labourers.\

**Sample selection and Data collection**

Sample selection was done using stratified random sampling (SRS) technique. Two hundred fifty two women members from fifteen dairy co-operatives (VDCs) participated in the study. Participants were interviewed to complete a schedule containing fourteen questions. The questions were indicators of empowerment e.g. suggestion acceptance in various family decisions, purchase decisions etc. were asked on a 0 to 4 point scale with 0 being disagree and 4 being strongly agree. Simultaneously, demographic and income data were collected from village dairy co-operatives (VDCs) and from Vasudhara dairy for analysis.

**RESULTS AND DISCUSSION**

**Descriptive Analysis**

40.08 percent participants are illiterate, 39.65% are educated up to primary school and 19.44% are educated up to high school and no one had been to college. Combining the top two categories i.e. strongly agree and mostly agree data shows that 97.22% women feel that their suggestions are now accepted in family purchase decisions, 86.9% women feel that their opinions are accepted in VDCs, 94.89% women believe that they can bring changes in society, 84.12% women believe that they can learn new skills, 88.09% women report that they can now raise their issues in group meetings, 86.11% women participate in village developmental activities, 71.03% women can raise their issues in Government offices, 91.66% women believe that they have enough potential, 96.83% women believe that their knowledge regarding Dairy Husbandry is increased, 95.24 % women are now better informed about government welfare schemes, 94.05% women have better information regarding educational opportunities, 98.02% women feel their need have increased now and 92.84% women report that women empowerment had taken place. The analysis is in Table 3.

**Regression Analysis**

As, monthly income of participants' is highly variable it was standardized by using the natural log transformation (to the base e) before conducting the analysis. Fourteen empowerment measures (as used in the survey)

making process in family and society which is in contrary to real environment. They further discussed, women overall don't know the cause to unbalance and tend to attribute the cause to either lack of efficiency in them or any other self-related shortages instead of realizing the true cause, social system.

As described by Zimmerman (1995), construct of empowerment is "that links individual strengths and competencies, natural helping systems, and proactive behaviors to social policies and social changes." It is understood as "people possessing the capacity to make effective choices; that is, to translate one's choices into desired actions and outcomes." (Alsop &Heinsohn,2005; Wendy Jassens, 2010).

Research shows that education plays a significant role in empowering women by addressing communicational skills, knowledge etc. Emily and Farah(2006) studied the role of Lebanese American University in education of Lebanon and Arab world. The findings show it significantly empowered Arab women in school classrooms in various activities like reading, writing, and teaching. Also, education is a long environment dependent variable for empowerment and so more research needs to be done for identification of sources for women empowerment. This research seeks to study dairy co-operatives as a probable route for women empowerment.

**RESEARCH MOTIVATION**

The motivation for this research comes from multiple sources. Many studies estimated the effect of dairy co-operatives on income and employment opportunities and it seems that dairy co-operatives have penetrated deeply to rural areas. In addition, dairy cooperatives are viewed as a tool for socio economic development for rural areas due to positive impact on income, living standards and knowledge levels.

Overall, research seems to have focus on the functional properties of dairy co-operatives which involves increased income generation, employment generation along with potential to connect rural milk production with the urban commercialization. The question of interest here is what effect or benefit, if any, does participation in dairy co-operatives have on the psychological construct of "empowerment" for women. The objective of this research is to understand how participation in dairy business through co-operatives affects women's feeling of empowerment. To be a member of dairy co-operatives is very distinct from participating in government welfare schemes, self-help groups or community based programmes.

A dairy co-operative member essentially is an owner of that organization and it involves conducting business activities which generates independent source of revenue for women. Women get involved in dairy husbandry activities, take risks for their business to get revenues which simultaneously decreases dependency and being a business owner should bring individual power. It is hypothesized that when women own a dairy business through dairy co-operatives their empowerment increases. Therefore:

$H_0$ : Income through dairy business has no effect

**Zinc**

The application of 100% sewage water ($T_9$) increased maximum Zn accumulation in 0-15, 15-30, 30-45 and 45-60 cm depth soils from 26.47 mg kg$^{-1}$, 19.48 mg kg$^{-1}$, 13.56 mg kg$^{-1}$ and 7.87 mg kg$^{-1}$, respectively (Table -4). The application of 100% tap water ($T_1$) increased uptake of the heavy metals and these metal contaminated edible portions act as poisons for human being and other living organisms. This is a matter of serious concern as vegetables, being prolific accumulators of heavy metals provide easy entry into food chain to these dreaded metals.
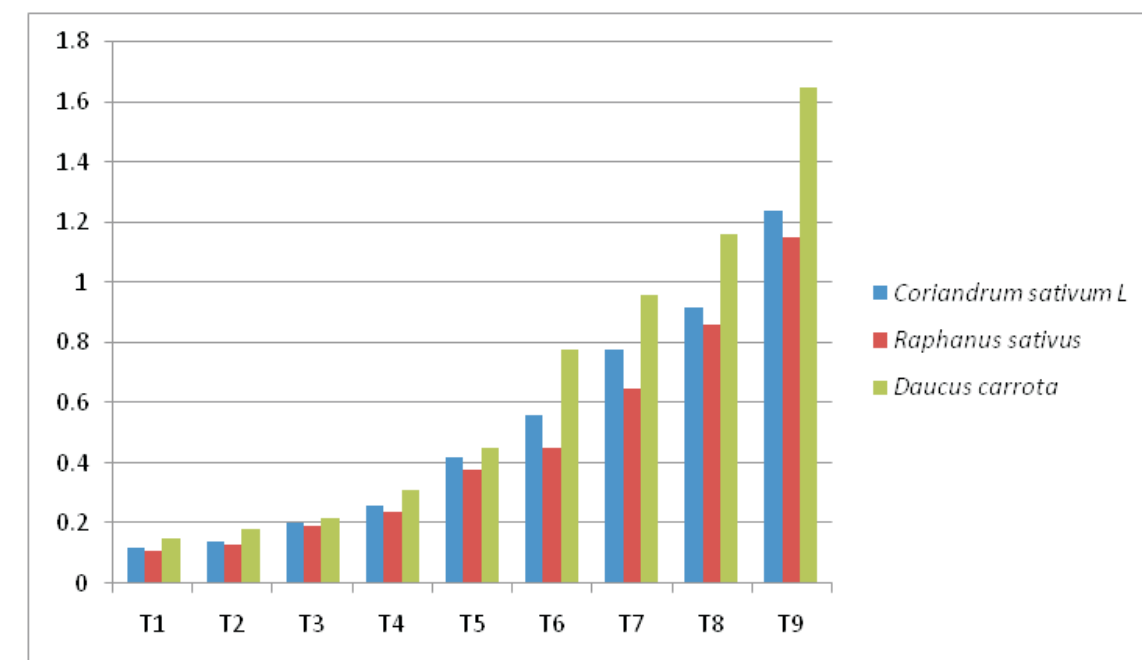


**Fig. -1. Cadmium uptake of vegetables in edible parts (mg kg$^{-1}$)**

minimum Zn accumulation in 0-15, 15-30, 30-45 and 45-60 cm depth soils from 11.45 mg kg$^{-1}$, 8.49 mg kg$^{-1}$, 5.58 mg kg$^{-1}$ and 4.34 mg kg$^{-1}$, respectively.Similar result was found by Mani et al. (2013).These results are also in tune with Mosleh and Almagrabi (2013) who reported that high level of Zn and Pb was found in soils (11.24 and 8.32 mg kg$^{-1}$) respectively.

**Heavy metals (Cd, Pb and Zn) uptake of vegetables grown on sewage contaminated soils**

Crops are one of the principal sinks for

**Cadmium**

The application of sewage water 100% ($T_9$) increased maximum Cd uptake in edible partsCoriandrum sativum L (Leaves), Raphanus sativus (Roots) and Daucus carrota (Roots) by 1.24 mg kg$^{-1}$, 1.15mg kg$^{-1}$ and 1.65mg kg$^{-1}$, respectively (Fig.-1). The application of tap water 100% ($T_1$) increased minimum Cd uptake in edible parts Coriandrum sativum L (Leaves), Raphanus sativus (Roots) and Daucus carrota (Roots) by 0.12 mg kg$^{-1}$, 0.11 mg kg$^{-1}$ and 0.15 mg kg$^{-1}$, respectively. Results showed that sewage water led to the

build-up of heavy metals in crop plants grown in that soil. However, Cd concentration in plants grown in tap water irrigated soils indicated safe background levels. Similar result was found by Lone et al., (2013). Chitdeshwari et al. (2002) reported that increased levels of sewage water increased the uptake of heavy metals including Cd and Cr in Amaranthus crop.

**Lead**

A wide range in plant concentration of Pb was found in sewage and tap water irrigated soils (Fig.-2). The application of sewage water 100% ($T_9$) increased maximum Pbuptake in edible parts Coriandrum sativum L (Leaves), Raphanus sativus (Roots) and Daucus carrota (Roots) by 5.87 mg kg$^{-1}$, 6.56mg kg$^{-1}$and 8.76mg kg$^{-1}$, respectively. The application of tap water 100% ($T_1$) increased minimum Pbuptake in edible parts Coriandrum sativum L (Leaves), Raphanus sativus (Roots) and Daucus carrota (Roots) by 0.20 mg kg$^{-1}$, 0.22mg kg$^{-1}$and 0.25mg kg$^{-1}$, respectively. Brar et al. (2000) also

reported higher accumulation of metals in tubers of potato grown on sewage irrigated soils as compared to those grown on tube well water irrigated soils. On comparison of heavy metal concentration with respect to initial concentration, concentration was below the critical concentration range which is 25 to 85 g/g for Pb (Macnicol and Beckett, 1985), indicating safe background levels. Similar results were reported by Mosleh and Almagrabi (2013) who reported Pb concentration (0.21, 0.26 and 0.32 mg kg$^{-1}$) in leaves of lettuce, squash and garden rocket respectively.

High metal concentrations in soil are one of the important environmental concerns (Lamali et al., 2007).Heavy metal contents in plants can be predicted easily for elements, which are bounded with low binding strength to the soil (Malla et al., 2007). Malla et al. (2007) have reported an improvement in the fertility status of the soils but with build-up of metallic cations in the soil upon sewage water irrigation.
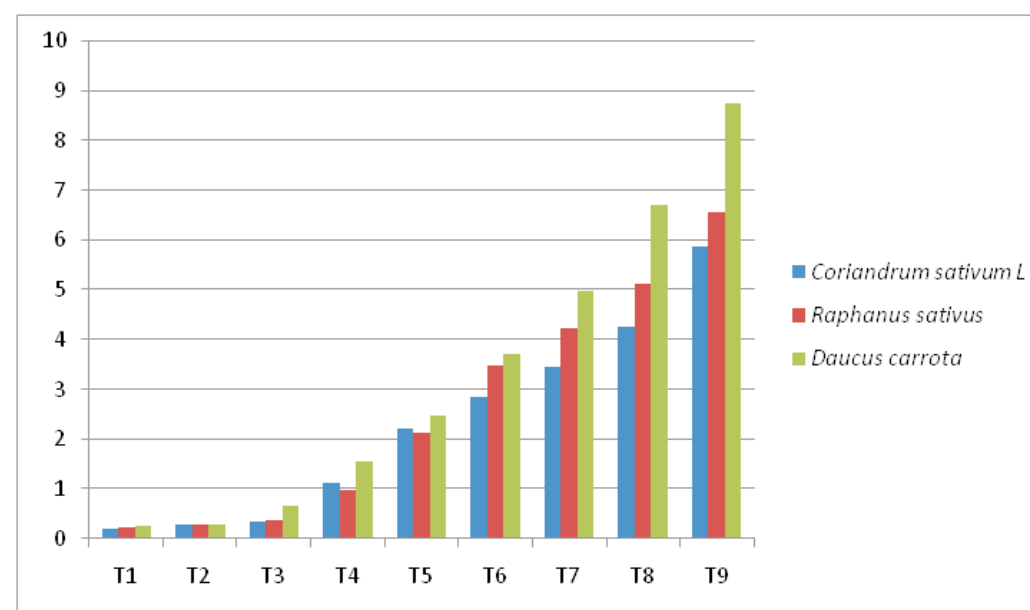


**Fig. -2. Lead uptake (mg kg$^{-1}$) of vegetables in edible parts**

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goal of the research is to understand the effects of participation in dairy business on the construct empowerment at individual level.

**Dairy-co-operatives**

Previous research has found that dairy co-operatives tend to have positive effect on income generation of people. For example, people who became members of co-operatives and participated in milk production through dairy co-cooperatives had an average income of Rs. 13,285.30 which was higher than non-members who earned on an average Rs. 3,602.75 (Meena *et. al.* 2009). The study additionally found that dairy co-operatives increased labour utilization per annum per household to 207.36 man days for members compared to 181.92 man days for non-members. Additionally, dairy co-operatives pay better prices to farmers (Singh, 2004), increase employment along with being viable (Sindhu *et al.* 2004) and significantly increase production of milk e.g. approximately 4.07 percent per annum from 1981 to 2002 leading to higher opportunities of milk processing on commercial scale by selling milk products in expanding domestic and international markets. (UshaTuteja and Narinder Singh 2004).

Overall, dairy farming has the necessary potential to enter in optimal plans of a farmer as a competitive enterprise which means that maintaining dairy animals would have to figure as a profitable farm enterprise in competition with cash and grain crop farming (Patel 1974).

Valsad District Co-operative Milk Producers Union Limited known as "Vasudhara" had taken task of socio economic development and women empowerment in

Dangs by creating network of dairy cooperatives and providing Dairy Husbandry as a profession for tribal women to earn livelihood. Vasudhara Dairy initiated dairy development activities in Dangs in the year 2001. As on 31st March2013, it has organized total 160 village-dairy co-operatives (VDCs') out of which 156 are exclusively controlled, managed and lead by women. Vasudhara dairy had provided all the backward and forward linkages needed for dairying.

**WOMEN EMPOWERMENT**

"*Woman has been suppressed under custom and law for which man was responsible and in the shaping of which she had no hand… women has as much right to shape her own destiny as man has to shape his…It is up to men to see that they enable them to realize their full status and play their part as equal of men"* (Mahatma Gandhi).

Inference from lines said by Mahatma Gandhi is, women don't have equal status and power and hence, a difference exists between status, rights and authority resulting in suppression of women. Women empowerment refers to increase in economic, social, political and spiritual strength of women which broadly involves activities for women to develop confidence in their own capabilities. Empowerment enables women to participate as equal citizens in the economic, political and social sustainable development of the rural communities.

Fatemi Iman et. al,(2011) argued that men and women should enjoy welfare conditions with equal access to resources and facilities, with equal participation in decision

# BUSINESS TO EMPOWERMENT: EFFECT OF DAIRY CO-OPERATIVES ON WOMEN EMPOWERMENT

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## ABSTRACT

Tribal villages face multiple constraints in the form of low education, low income which forces majority of the families to live below the poverty line. The study examines effect of dairy cooperatives on women empowerment for tribal villages. Results show that participation in dairy business through dairy cooperatives increases women empowerment in tribal villages and district. Participation in dairy business has direct impact on women empowerment with women reporting increased confidence in their own abilities, learned new skills and participated in village development activities. Women reported increase in acceptance of their suggestions in family affairs along with an increased involvement outside the family such as group meetings and raising issues in government offices. Overall, the study finds strong evidence that independent income generation by women due to participation in dairy business through dairy cooperatives leads to women empowerment, both objective and subjective.

According to Census of India report 2011, more than 833 million Indian people reside in rural areas. India has been and still continues to be a land of village community. The Dairy cooperative movement is seen to have created significant impact on financial and economic activities along with generating employment opportunities for around 13.9 million farm families. It strengthened infrastructure for milk collection, transportation, processing, packaging, pricing, and marketing of dairy products which eliminated exploitation of producers. India's milk production increased from 21.2 million MT in 1968-69 to 112 million MT in 2009-10(Anonymous, 2011c) i.e. an annual growth of 4% during the period 1993-2005, almost 3 times the average growth rate of the dairy industry in the world. Dairy Cooperatives account for the major share of processed liquid milk marketed in the India and milk is processed and marketed by 170 Milk Producers' Cooperative Unions, which federate into 15 State Cooperative Milk Marketing Federations (MOFPI, 2011). The

## Zinc

The application of sewage water 100% ($T_9$) increased maximum Zn uptake in edible parts *Coriandrums ativum L (Leaves), Raphanus sativus (Roots) and Daucus carrota* (Roots) by 259.33%, 246.91%and 249.65%, respectively as compared to control pots ($T_1$). The application of tap water 100% ($T_1$)



**Fig. -3. Zinc uptake (mg kg$^{-1}$) of vegetables in edible parts**

increased minimum Zn uptake in edible parts Coriandrum sativum L (Leaves), Raphanus sativus (Roots) and Daucus carrota (Roots) by 2.68 mg kg$^{-1}$, 2.43 mg kg$^{-1}$and 2.82 mg kg$^{-1}$, respectively. The data showed (Fig.-3) that Zn uptake (mg kg$^{-1}$) trend by vegetables was Daucus carrota (Roots 9.86) > Coriandrum sativum L (Leaves 9.63)> Raphanus sativus (Roots 8.43) in edible parts. Similar result was reported by Mosleh and Almagrabi (2013). Studies by Berry and Wallace (1989)indicated that Zn phytotoxicity in most leafy vegetables (expressed by reduced growth). Earlier studies

by Khan and Marwari, (2003) reported high concentration of heavy metal in vegetables grown in agricultural fieldsreceiving textile waste water. Metal accumulation in vegetables may pose a direct threat to human health (Damek-Poprawa and Sawicka-Kapusta 2003; Cambra et al., 1999).

## CONCLUSIONS

Results reveale that sewage water was polluted with Cd, Pb and Zn due to disposal of house hold and commercial wastes into the sewage drain. The concentrations of heavy metals were significantly higher in sewage water than tap water. Cd, Pb and Zn concentrations in sewage water were above the permissible limits for their disposal on agricultural land and mean total Cd, Pb, and Zn concentration in tap water are safe background levels. The concentration of Cd, Pb and Zn was significantly higher in all sewage irrigated soils

($T_2$ to $T_9$) at all the four depths (0-15, 15-30, 30-45 and 45–60 cm), respectively. The pattern of distribution of heavy metals is uniform. However, Cadmium, Lead and Zinc concentration are higher at the surface horizons and it decreases sharply with depth in both tap water and sewage irrigated soils. The extent of heavy metal built up in sewage irrigated soils was significant in both 0-15 and 15–30 cm depth, respectively. Data further indicate enrichment of heavy metals due to the discharge of sewage water and sludge mostly in the surface layer with very little mobility down the profile.

Vegetables commonly grown in the sewage and tap water irrigated area, are *Coriandrum sativum* L, *Raphanus sativus* and *Daucus carrota* higher concentration of Cd, Pb and Zn, were observed in the edible parts of all crops grown in 100% sewage irrigated soils ($T_9$) compared to that of crops grown on 100% tap water irrigated soils ($T_1$). Results of this study, therefore, indicate that long term and indiscriminate application of sewage water which contains heavy metals may cause accumulation of heavy metals in surface and sub-surface soils and the build-up of heavy metals on soil profile may prove harmful not only to plants, but also to consumers of the harvested crops.

## ACKNOWLEDGEMENT

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(4) The average thousand grain mass was decreased from 415.39 to 262.12 g with maturity 50-100 days.

(5) The bulk density and true density increased from 593.90 to 714.86 kgm$^{-3}$ and from 1350 to 1467kgm$^{-3}$ respectively, while the bulk porosity decreased from 56.007 to 51.270% with crop maturity 50-100 days.

(6) The angle of repose decreased from 33.424 to 23.962$^{0}$ over maturity days 50-100.

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### 3.5 Bulk density

The grain bulk density at different maturity levels varied from 593.90 to 714.86 kg-m$^3$ (fig.7) and indicated a linear increase with crop maturity. This was due to the fact that a decrease in mass owing to reduction in kernel moisture was lower than accompanying volumetric shrinkage of the kernels (Nimkar and Chattapadyay 2001, Konak *et. al.* 2001) The bulk density of kernels can be mathematically represented as

$(Pb) = 25.11D+573.5 \, (r^2=0.973)$    (16)

### 3.6 True density

The true density varied from 1350 to 1467 kg-m$^{-3}$ with crop maturity (Fig. 8). The increase in true density with maturity might be attributed to the relatively lower true volume as compared to the corresponding mass of the kernels decreased due to reduction of moisture with maturity. The results were in conformity with the other researchers (Dutta *et. al.* 1988, Shepherd and Bhardwaj 1986, Nimkar and Chattapadyay 2001). The true density of kernels was found to bear the following relationship with maturity days

$Pt = 22.94 \, D + 1330 \, (r^2=0.965)$    (17)

### 3.7 Porosity

Since the porosity depends on the bulk as well as true or kernel densities, the magnitude of variation in porosity depends on these factors only. Fig. 9 illustrates that the porosity of bengal gram kernels decreased with increase in maturity level. The bulk porosity was found to decrease linearly from 56.00 to 51.27% in the specified maturity levels. The trend observed in bengal gram kernels is similar to that of pigeon pea (Shepherd and Bhardwaj 1986) and lentil (Carman 1996).

The relationship between porosity and the maturity days of the kernels was linear;

$= -1.059 \, D + 56.83 \, (r^2=0.965)$    (18)

### 3.8 Angle of repose

Fig.10 shows the experimental values of the angle of repose for bengal gram kernels at various maturity levels. The angle of repose decreased from 33.424 to 23.96 degrees with crop maturity of 50–100 days. The value of angle of repose for bengal gram kernels seed was considerably less than those reported for pigeon pea and fababean seed (Fraser *et. al.* 1978, Shepherd and Bhardwaj 1986).

The values of the angle of repose α for bengal gram bear the following relationship with maturity days;

$\alpha = -2.125 \, D + 35.62 \, (r^2=0.996)$   (18)

### CONCLUSIONS

(1) At 50th day of maturity of bengal gram kernels the average moisture content was 90% (wb) which decreased to 60% (wb) at 100th day of maturity.

(2) The range of average length, width, thickness was 9.536 to 12.499 mm, 2.949 to 8.604 mm, 5.99 to 8.29 mm, over the maturity of crop 50-100 days.

(3) With crop maturity the geometric mean diameter increased from 0.7188 to 0.9001mm and sphericity increased from 0.6364 to 0.8241.

Colorimeter (Model CFLX/DIFF, CFLX-45) was used in the present investigation. A cylindrical glass sample cup (6.35cm dia. x 4 cm deep) was placed at the light port (3.175 cm dia). After calibration, the colour values (L*, a*, b*) of each sample were recorded.

## 3. RESULTS AND DISCUSSION

### 3.1 Moisture Content

Fig.1 shows variation in moisture content of the bengal gram kernels with to the level of maturity i.e. days after sowing. The moisture content varies from 90.26 to 60.01% wb with mean value as 72.75 % wb. The moisture content showed a linear decrease with increasing days of maturity and bears the following relationship with a regression coefficient 0.969:

$$M.C. = -5.196 D + 93.97 \qquad (5)$$

### 3.2 Seed dimensions, sphericity and geometric mean diameter of kernels

Fig.2-4 presents the change in seed dimensions, sphericity and geometric mean diameter of bengal gram kernels with crop maturity level. It is clear that kernel dimension increases with days of maturity. The average values of length, width and thickness were 10.84, 6.07 and 7.27 mm, respectively. The average values of geometric mean diameter and sphericity were calculated as 8.358 mm and 87.589 % respectively. Kural and Carman (1997) and Konak *et. al.* (2001) have reported the value for sphericity of chick pea as 83.2 %.

A linear relationship exist between the seed dimensions and crop maturity and

expressed by the following equations for the length L, width B, thickness T, sphericity $\phi$, geometric mean diameter $D_m$:

$$L = 0.516D + 8.881 \ (r^2 = 0.976) \qquad (6)$$
$$B = 1.162D + 2.063 \ (r^2 = 0.977) \qquad (7)$$
$$T = 0.468D + 5.607 \ (r^2 = 0.988) \qquad (8)$$
$$\phi = 3.719D + 60.84 \ (r^2 = 0.976) \qquad (9)$$
$$D_m = 0.035D + 0.684 \ (r^2 = 0.976) \qquad (11)$$

### 3.3 Colour

Fig. 5 shows the effect of maturity on the colour of the bengal gram kernels. The colour value increases with crop maturity. The relationship between colour values and maturity days was found to be linear and can be expressed by the following equations;

$$L* = 1.517 D + 11.04 \ (r^2 = 0.986) \qquad (12)$$
$$a* = 2.05 D - 2.516 \ (r^2 = 0.965) \qquad (13)$$
$$b* = 0.793 D + 15.42 \ (r^2 = 0.982) \qquad (14)$$

As the crop matures the green color of kernel diminishes and turns to pale yellow. The 'a' value changes more rapidly with maturity in comparison to 'b' and 'L' value.

### 3.4 Mass of thousand grain

The average mass of the fresh bengal gram kernels decreases linearly with maturity, as shown in the fig.6. As the moisture content of the kernels decreases, the mass of the thousand kernels also decreases (Kulkarni *et. al.* 1993, Dutta *et. al.* 1988 and Fraser *et. al* 1978)

The mass of 1000 bengal gram kernels ($W_t$) depicted a linear decrease with crop maturity and bears the following relationship with a regression coefficient 0.971:

$$W_t = -32.19 D + 463.9 \qquad (15)$$

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# SYNTHESIS OF SPIROOXINDOLE DERIVATIVES CATALYZED BY K10-MONTMORILLONITE IN AQUEOUS MEDIUM

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## ABSTRACT

The facile and efficient one-pot three component synthesis of biologically valuable spirooxindole is described under greener condition through sequential Knoevenagel–Michael–cyclization reactions. Reaction facilitates under aqueous condition at $60^0C$ and catalyzed by K10-montmorillonite as a heterogeneous catalyst using model substrate isatin, malononitrile and dimedone. The adopted approach offers the advantages of easy handling, high atom economy, short reaction time, wide substrate scope, low environmental impact and high yield. The K10-montmorillonite is recovered by simple filtration and reused several times without any loss in its catalytic activity.

*Keywords:* Isatin, malononitrile, dimedone, montmorillonite, aqueous phase

Multicomponent reactions (MCRs) offer significant advantages over conventional linear-type synthesis as more often are recognized cost-effective and comparatively fast routes though generating less chemical waste.[1] In addition to the intrinsic atom economy and selectivity underlying such reactions, simpler procedures, equipment, time, and energy savings as well as eco friendly have all led to a sizable effort to design and

implement MCRs in both academia and industry. (Ramon and yus, 2005)

The spirooxindole unit is a privileged heterocyclic motif that forms the core of a large family of natural products with strong bioactivity profiles and interesting structural properties. Sunberg (1970), Gallifor and Scheidt (2007), Deppermann and Thomanek (2010). For example, coerulescine, elacomine, horsfiline, welwitindole A, spirotryprostatin A, alstonine and surugatoxin. Barran and Richhar (2005), Chang et. al (2005). They display potent cytotoxic activity and are also known as h5-HT6 serotonin receptor, estrogen receptor, modulators, antiproliferative agents, oxytocin antagonists. Edmonsan and Danishefsky (1997) Zaveri et. al. (2004), Tokhaga et. al (2001) rather than this they also exhibit antibacterial, antimalarial, antianaphylatic and antifungal activities. Sundberg (1996), yeung et. al (2010) (Fig. 1). On the basis of biological studies that show the existence of two or more different heterocyclic moieties in a single molecule often remarkably enhances the biocidal profile, we intended the synthesis of a series of spiro-fused oxindole derivatives. It is highly desirable to develop a chemical system that can mimic the action of enzymes and effect organic reactions in water with excellent efficiency and selectivity. The unique properties of water in aqueous medium like high dielectric constant

and cohesive energy density showed an extraordinary effect on reaction rates. Moreover, its cost-effectiveness, high abundance, non-inflammability and non-toxic nature increased its applicability. Kidniani et. al., (2005).



Antimalarial     Spirotryprostatin A
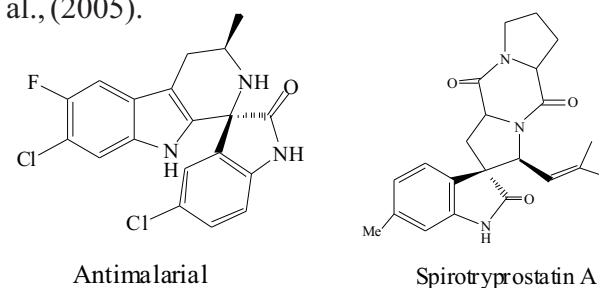
**Fig 1. Selected biologically active compounds containing spiro-2-oxindole moiety.**

In this context, considerable attention has been devoted to perform organic transformations using solid acids as heterogeneous catalysts. Corma (1997), Verma (2002), Dhakshinamoorthy et. al, 2012, 2013). In the present work, we report a new synthetic strategy for the synthesis of spirooxindole derivatives catalyzed by K10 clay under mild reaction conditions. K10 clay is a layered aluminasilicate clay with a dioctahedral layer sandwiched between two tetrahedral layers.[11] K10 clay, with a moderate acid strength and a surface area of 250 m$^2$/g, can be used as heterogeneous catalyst for various organic transformations due to their tunable Bronsted and Lewis acidities. Tahabe et. al (1999), Sels, et. al (2001). It is also considered to be an environmentally benign solid acid catalyst that offers several advantages such as ease of handling, non-corrosiveness, low cost, recyclability and reusability.

## MATERIALS AND METHODS

All chemical were reagent grade purchased from Aldrich and Alfa Aesar and were used without purification. NMR spectra were recorded on a BRUKER AVANCE II-400FT Spectrometer (400 for 1HNMR, 100MHz for 1335 C) using DMSO as solvent and TMS as an internal reference. Mass spectra were recorded on JEOL SX-102 (FAB) mass spectra at 70ev. Elemental analysis were carried out in a Coleman automatic carbon, hydrogen, oxygen, sulphur and nitrogen analyzer. All the reactions were monitored by TLC using 40 precoated sheets of silica gel G/UV-254 of 0.25mm thickness (Merck 60F254). Melting points were determined by open glass capillary method and were uncorrected.

## General procedure for the synthesis of Spirooxindole derivatives:

Substituted isatin (1 mmol), malononitrile (1 mmol) and substituted dimedone (1 mmol) were dissolved in water (3mL). To this solution K 10 clay (50mg) was added and heated at 60$^0$C for 2.5 h. After completion, the reaction mixture was filtered to remove the catalyst and washed with ethyl acetate (5-7mL). The filter was concentrated and the residues was purified by column chromatography using hexane/ethyl acetate (15%) as an eluent to afford product in high yield. The recovered catalyst was thoroughly washed with ethyl acetate, air dried, activated at 80$^0$C for 2 h and reused for successive runs.

## Spectral data

**2-Amino-5-oxo-7,7-dimethyl-spiro[(4H)-5,6,7,8-tetrahydrochromene-4,3'-(3'H)-indol]-(1'H)-2'-one-3-carbonitrile (4a).** White solid; mp 290–291 $^0$C. IR: 3380, 3310,

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The objective of this study was to investigate some physical properties such as moisture content, linear dimensions, unit mass and volume, sphericity, density, porosity, angle of repose of the green (immature) Bengal gram kernel depending upon crop maturity from 50-100 days.

## MATERIALS AND METHODS

Samples of bengal gram crop cultivar "*Pratap Chana 01*" were collected from instructional farm of the College of Technology and Engineering, Udaipur at desired crop maturity level. The pods were separated from plant and shelled individually to obtain kernels. The kernels were immediately used for experimentation.

The initial moisture content was determined by using the hot air oven method (Ranganna, 1986). The sample was kept at 100$^0$C for 16-18 hr in an oven and final weight was noted.

To determine the average size of the grain, a sample of 100 randomly selected kernels and their three principal dimensions were measured using a vernier caliper to an accuracy of 0.02 mm (Nimkar and Chattopadhyay, 2001). The geometric mean diameter Dm of the grain was calculated by using the following relationship :

$$Dm = (LBT)^{\frac{1}{3}} \qquad (1)$$

The degree of sphericity (φ) was calculated by following relationship (Mohsenin, 1986)

$$(\phi) = \frac{(LBT)^{\frac{1}{3}}}{L} \qquad (2)$$

Thousand kernels mass was determined with the standard method (ISI, 1986b).

The bulk density *(Pb)* of grain based on the volume occupied by the bulk sample was measured using a standard hectoliter (ISI, 19686a). The true density *(Pt)* defined as the ratio between the mass of bengal gram kernels and true volume of seed was determined using the toluene displacement method (Sacilik, 2003). Porosity ( ) of the bulk is the ratio of volume of internal pores within the kernels to its bulk volume and was determined as follows (Nimkar and Chattopadhyay, 2001)

$$= 100 \left(1 - \frac{Pb}{Pt}\right) \qquad (3)$$

The angle of repose (α) the angle with the horizontal at which the material will rest in a pile. This was determined by using an open–ended cylinder of 15 cm diameter and 50 cm height. The cylinder was placed at the centre of a circular plate having a diameter of 70 cm and was filled with bengal gram kernels. The cylinder was raised slowly until it formed a cone on the circular plate. The height of the cone was recorded by using a moveable pointer fixed on a stand having a scale of 0.1 cm precision. The angle of repose was calculated using the (Kaleemullah and Guasekar 2002, Karababa, 2006, Nimkar and Chattopadhyay 2001, Shepherd, 1986).

$$\alpha = \tan^{-1}\left(\frac{2H}{d}\right) \qquad (4)$$

Color is important to consumer as a means for identifying and judging quality for its basic aesthetic value. Colour is a vital constituent of the food. A Hunter Lab

# STUDY OF SOME PHYSICAL PROPERTIES OF IMMATURE BENGAL GRAM KERNELS

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## ABSTRACT

Physical properties of Bengal gram kernels were evaluated as function of crop maturity from 50 to 100 days. The moisture content of the kernels decreased from 90 to 60 % (w.b.) over the crop maturity days of 50-100. The range of length, width, thickness, geometric mean diameter, thousand grain mass were 9.536 to 12.499 mm, 2.949 to 8.604 mm, 5.99 to 8.29 mm, 0.71 to 0.90 mm, 421.39 to 262.12 g, respectively. Study showed that as maturity level increased, bulk and true density increased from 593.90 to 714.86 kg m$^{-3}$ and from 1350 to 1467 kg m$^{-3}$, respectively. With increasing maturity level, porosity and angle of repose decreased from 56.007 to 51.270 % and from 33.424 to 23.962$^{0}$, respectively.

Bengal gram (*Cicer arientimum L.*) also known as 'chickpea' or 'chana' is a member of leguminous family. It is a major pulse crop in the Indian subcontinent and several other countries. Known for rich protein content, bengal gram is used as an edible seed as well as for making flour. The immature gram kernels are used for making vegetables and other preparations. This crop is broadly divided into two categories viz. *Kabuli* and *Desi* according to the colour, seed size and taste.

India is the leading producer and consumer of bengal gram in the world. Normally it accounts for around 40% of India's total pulses crop production of 12-15 million tons. Major producing states are Madhya Pradesh, Uttar Pradesh, Rajasthan and Maharashtra. The production of bengal gram in the year 2010-11 was 8.25 million tons from an area of 9.51 million hectares. Its production has increased by 36 % between 2004 and 2011 with 25 % expansion in acreage and 9 % improvement in yield. In Rajasthan, Bengal gram is cultivated as a rainfed crop in most of the districts; therefore production fluctuates year to year (website).

Konak *et. al*.(2001) studied the physical properties of the chick pea seeds in the moisture content range from 5-16 %, by making sample through wetting the dried seeds. No literature could be located for database on physical properties of green or immature bengal gram kernels with respect to crop maturity.

3141, 2963, 2192, 1721, 1659, 1605, 1466, 1350, 1219, 1057, 903, 748, 679, 556 cm$^{-1}$. $^{1}$H NMR (DMSOd$_{6}$, 400 MHz): d 10.37 (s, 1H, NH), 7.20 (br s, 2H, NH$_{2}$), 7.14 (t, 1H, J=10.0 Hz, ArH), 6.97 (d, 1H, J=9.6 Hz, ArH), 6.88 (t, 1H, J=10.0 Hz, ArH), 6.78 (d, 1H, J=10.0 Hz, ArH), 2.56 (d, 2H, J=7.2 Hz, CH2), 2.18 (d, 1H, J=21.2 Hz, CH), 2.08 (d, 1H, J=21.6 Hz, CH), 1.03 (s, 3H, CH3), 1.00 (s, 3H, CH3). Anal. Calcd for C$_{19}$H$_{17}$N$_{3}$O$_{3}$: C, 68.05; H, 5.11; N, 12.53. Found: C, 68.25; H, 5.21; N, 12.62.

**2-Amino-5-oxo-7,7-dimethyl-spiro[(4H)-5,6,7,8- tetrahydrochromene-4,3'-(3'H)-5'-methyl-indol]-(1'H)- 2'-one-3-carbonitrile (4b).** White solid; mp 279–281$^{0}$C. IR: 3364, 3311, 3141, 2964, 2192, 1721, 1659, 1605, 1497, 1350, 1219, 1165, 1049, 910, 810, 663 cm$^{-1}$. $^{1}$H NMR (DMSO-d$_{6}$, 400 MHz): d 10.24 (s, 1H, NH), 7.16 (br s, 2H,NH$_{2}$), 6.92 (d, 1H, J=10.4 Hz,ArH), 6.76 (s, 1H, ArH), 6.67 (d, 1H, J=7.6 Hz, ArH), 2.51–2.55 (m, 2H, CH$_{2}$), 2.18 (s, 3H, CH$_{3}$), 2.10–2.15 (m, 2H,CH$_{2}$), 1.02 (s, 3H,CH$_{3}$), 0.99 (s, 3H, CH$_{3}$). Anal. Calcd for C$_{20}$H$_{19}$N$_{3}$O$_{3}$: C, 68.75; H, 5.48; N, 12.03. Found: C, 68.92; H, 5.56; N, 12.12.

**2-Amino-4'-bromo-1',2',5,6,7,8-hexahydro-7,7-dimethyl-2',5-dioxospiro[4H-1-benzopyran-,3'-[3'H]-indole]-3-carbonitrile (4c).** White solid; mp 295 – 296$^{0}$C. IR: 3363, 3310, 3152, 2962, 2199, 1724, 1659, 1605, 1497, 1350, 1219, 1048, 928. $^{1}$HNMR: 10.41 (s, NH); 7.28 (br. s, NH$_{2}$); 7.14 (t, J=7.6, 1 arom. H); 6.98 (d, J=7.2, 1 arom. H); 6.78 (d, J=7.6, 1 arom. H); 2.56 (d, J=7.6, CH$_{2}$); 2.17 (d, J=15.6, CH); 2.08 (d, J=16.0, CH); 1.03 (s, Me); 1.00 (s,

Me). Anal. calc. for C$_{19}$H$_{16}$BrN$_{3}$O$_{3}$: C, 55.09, H, 3.89, N, 10.14; found: C, 55.19, H, 3.97, N, 10.19.

**2-Amino-5-oxo-7,7-dimethyl-spiro[(4H)-5,6,7,8-tetrahydrochromene-4,3'-(3'H)-7'-chloro-indol]-(1'H)-2'-one-3-carbonitrile (4d).** White solid; mp 291–293$^{0}$C. IR: 3355, 3313, 3148, 2962, 2192, 1726, 1675, 1604, 1491, 1355, 1219, 1047, 911, 805, 748, 663,578 cm$^{-1}$. $^{1}$HNMR (DMSO-d$_{6}$, 400 MHz): d 10.40 (s, 1H, NH), 7.45 (br s, 2H, NH$_{2}$), 7.10–7.21 (m, 1H, ArH), 6.81–6.89 (m, 2H, ArH), 2.51–2.54 (m, 2H, CH$_{2}$), 2.04–2.15 (m, 2H, CH$_{2}$), 1.02 (s, 3H, CH3), 0.98 (s, 3H, CH$_{3}$). Anal. Calcd for C$_{19}$H$_{16}$ClN$_{3}$O$_{3}$: C, 61.71; H, 4.36; N, 11.36. Found C, 61.85; H, 4.52; N, 11.59.

**2-Amino-1',2',5,6,7,8-hexahydro-7,7-dimethyl-5'-nitro-2',5-dioxospiro[4H-1-benzopyran-4,3'-[3H]-indole]-3-carbonitrile (4e).** White solid. mp 280–281$^{0}$C. IR: 3390, 3252, 3197, 2959, 2876, 2190, 1741, 1681, 1645, 1473, 1343, 1289, 1224, 1168, 1061, 913. $^{1}$H-NMR: 11.44 (s, NH); 8.39 – 8.46 (m, 1 arom. H); 8.21 – 8.27 (m, 1 arom. H); 7.79 (br. s, NH$_{2}$); 7.31 (d, J=8.6, 1 arom. H); 2.81 – 2.94 (m, CH$_{2}$); 2.35 – 2.51 (m, CH$_{2}$); 1.29 (s, 2 Me). Anal. calc. for C$_{19}$H$_{16}$N$_{4}$O$_{5}$ : C, 60.0, H, 4.24, N, 14.73; found: C, 60.28, H, 4.35, N, 14.64.

**2-Amino-5-oxo-spiro[(4H)-5,6,7,8-tetrahydrochromene-4,30-(30H)-indol]-(10H)-20-one-3-carbonitrile (4f).** White solid; mp 251-253 $^{0}$C. IR: 3372, 3287, 3133, 2955, 2191, 1698, 1613, 1466, 1350, 1211, 1011, 933,

764, 679 cm$^{-1}$. 1H NMR (DMSO-d$_6$, 400 MHz): d 10.39 (s, 1H, NH), 7.21 (br s, 2H, NH2), 7.13 (t, 1H, J=7.6 Hz, ArH) 7.01 (d, 1H, J=7.6 Hz, ArH), 6.88 (t, 1H, J=7.6 Hz, ArH), 6.77 (d, 1H, J=8.0 Hz, ArH), 2.63–2.67 (m, 2H, CH$_2$), 2.30–2.37 (m, 2H, CH$_2$), 1.90–1.93 (m, 2H, CH$_2$). Anal. Calcd for C$_{17}$H$_{13}$N$_3$O$_3$: C, 66.44; H, 4.26; N, 13.67. Found: C, 66.23; H, 4.41; N, 13.89.

## RESULTS AND DISCUSSION

As a consequence the development of eco-affable practical synthetic routes under involving green chemistry and the growing focus on eco-friendly processes prompted us to revisit the synthesis of spirooxindole. The reaction conditions were optimized for the synthesis of spirooxindole using isatin, malononitrile and dimedone as model substrates (Scheme 1) and the observed results are given in Table 1. In the absence of solvent, K10 clay gave 13% and 63% yields at room temperature and 60$^0$C respectively in 4 h (Table 1, entries 1 and 2). Further, increasing the reaction time to 7 h at 60$^0$C improved the yield to 75% (Table 1, entry 3) and it can be considered as an encouraging result from the green and sustainable process. K10 clay showed highest yield of 92% in water in 3 h while ethanol gave 80% under identical conditions and no further increase in yield was noticed even after 6 h at 60$^0$C (Table 1, entries 6-8). Further, the reactions were performed using water as a solvent from the perspective of yield and potentially more interesting from green and sustainable processes points of view. On the other hand, 78% yield (Table 1, entry 5) of the desired product was obtained in water at room temperature in 8 h. The yield plateaued when temperature was further increased to 70, 80 and 90$^0$C (Table 1, entries 12-13). Moderate to high yields were achieved with conventional organic solvents (Table 1, entries 9-11).

**Scheme 1: Model Reaction**
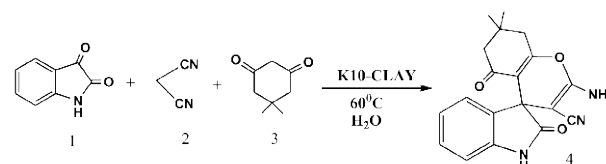


**Table 1: Screening of Reaction condition$^a$**

| Entry | Catalyst | Solvent | Temp. ($^0$C) | Time (h) | Yield$^b$ (%) |
|---|---|---|---|---|---|
| 1 | K-10 clay | none | rt | 4 | 13 |
| 2 | K-10 clay | none | 60$^0$C | 4 | 63 |
| 3 | K-10 clay | none | 60$^0$C | 7 | 75 |
| 4 | K-10 clay | water | 60$^0$C | 3 | 92 |
| 5 | K-10 clay | water | rt | 8 | 78 |
| 6 | K-10 clay | EtOH | rt | 3 | 55 |
| 7 | K-10 clay | EtOH | 60$^0$C | 3 | 80 |
| 8 | K-10 clay | EtOH | 60$^0$C | 6 | 82 |
| 9 | K-10 clay | DMF | 60$^0$C | 3 | 56 |
| 10 | K-10 clay | ACN | 60$^0$C | 3 | 66 |
| 11 | K-10 clay | DCM | 60$^0$C | 3 | 70 |
| 12 | K-10 clay | water | 70$^0$C | 3 | 93 |
| 13 | K-10 clay | water | 80$^0$C | 3 | 92 |

$^a$The reaction was carried out with isatin, malononitrilr and dimedone in water catalyzed by K10 clay. bIsolated Yields.
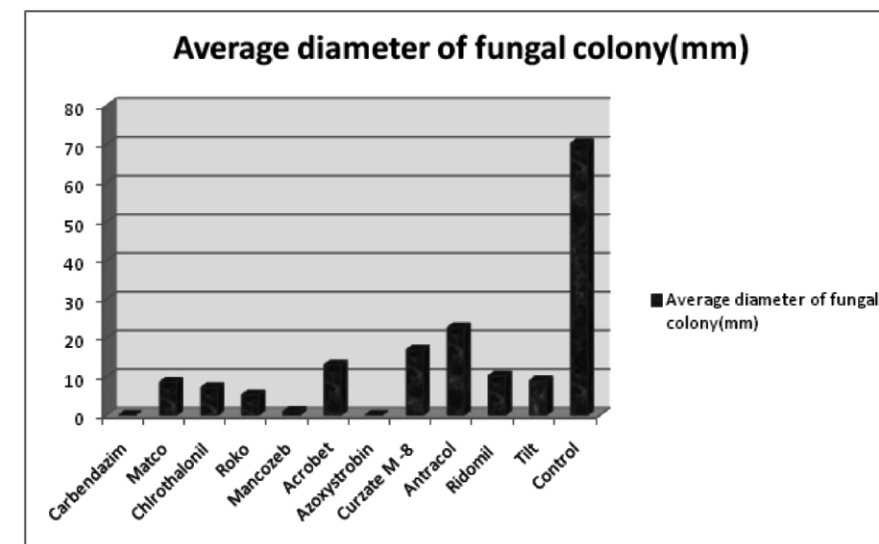
**Fig. -1 Inhibitory effect of different fungitoxicants on the growth of** *Colletotrichum lindemuthianum in vitro*

It is revealed from the above and its corresponding bar diagram that all fungitoxicants gave better response in inhibiting the growth of pathogen over control. Carbendazim and Azoxystrobin were found most effective and these fungitoxicants inhibited the fungal growth up to 100 percent when they were used 0.1 percent and 0.03 percent . which were statistically at par with Mancozeb (98.58%). The next fungitoxicants Roko, Chlrothalonil, Matco,Tilt, Ridomill were showed their effectiveness in descending order. However the minimum inhibitory effect of pathogen was recorded with Antracol (67.73%) when it was tested at 0.1 percent. The simillar result were also made by Shirshikar(1995) and Puroshothaman e*t. al.* (2007).

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**Table 2. Inhibitory effect of different fungi toxicants on the growth of *Colletotrichum lindemuthianum in vitro*.**

| S.No | Chemicals | Dose (%) | Average diameter of fungal colony(mm) | Percent inhibition over control |
|------|-----------|----------|----------------------------------------|----------------------------------|
| 1. | Carbendazim | 0.1 | 0.00 | 100.00 |
| 2. | Azoxystrobin | 0.03 | 0.00 | 100.00 |
| 3. | Mancozeb | 0.2 | 1.0 | 98.58 |
| 4. | Roko | 0.2 | 5.25 | 92.52 |
| 5. | Chlrothalonil | 0.2 | 7.10 | 89.89 |
| 6. | Matco | 0.2 | 8.55 | 87.82 |
| 7. | Tilt | 0.1 | 8.95 | 87.25 |
| 8. | Ridomil | 0.2 | 10.15 | 85.54 |
| 9. | Acrobet | 0.2 | 12.95 | 78.70 |
| 10. | Curzate M -8 | 0.2 | 16.85 | 75.99 |
| 11. | Antracol | 0.1 | 22.65 | 67.73 |
| 12. | Control | - | 70.20 | - |
| | CD at 5% | | 2.2368 | - |
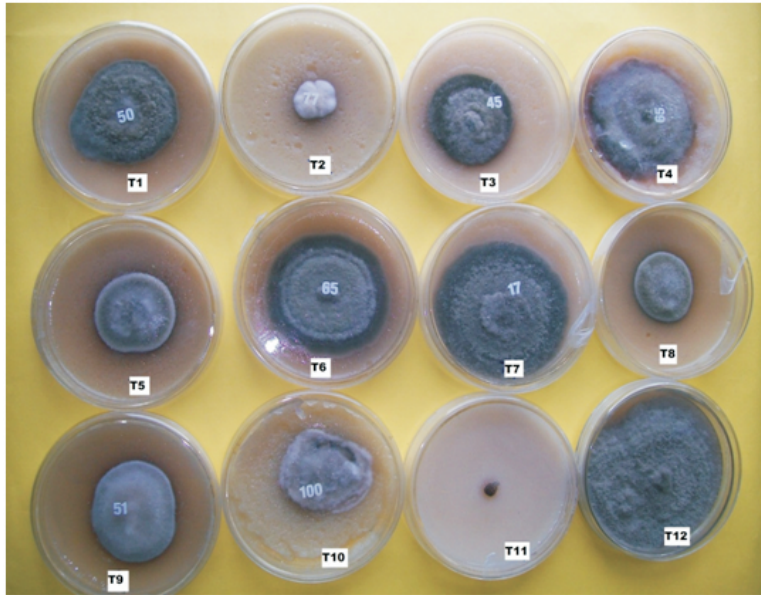


Effect of different fungicides against the growth of *Colletotrichum lindemuthianum*

On the other hand, efforts were also made to optimize the catalyst loading in this reaction and the observed results are given in Fig 2. It can be seen very clearly that the percentage yield gradually increased from 20 to 50 and reaches a maximum at 80 mg of catalyst loading. Further, increase of catalyst amount fails to increase the yield suggesting an optimal value of catalyst loading for this reaction under the present experimental conditions.
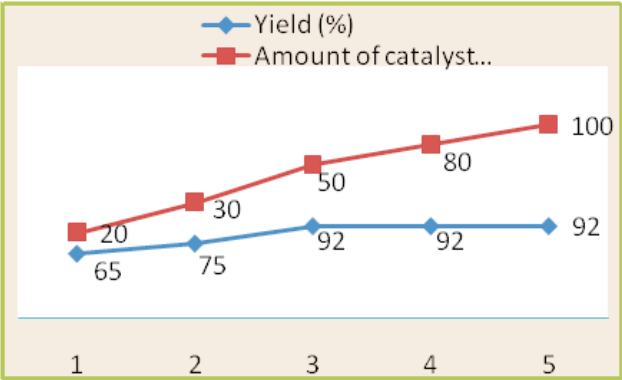


Fig 2: Effect of catalyst loading on the yield of Spirooxindole. Reaction conditions: Isatin (1 mmol), malononitrile (1 mmol), dimedone (1 mmol), K10 clay, water (6 mL), 60 0C, 3 h.

As shown in Table 2 it was found that this procedure works with a wide variety of substrates. Six types of substituted isatins and 1,3-cyclohexanediones were used in this reaction . It is very clear from the observed results that the natures of the substituents, steric hindrance and molecular dimension of the reactants have a minimal role to play in determining the rate of reaction as a result most of the reactions afforded very high yields under mild reaction conditions. One of the main advantages of using heterogeneous catalysts such as K10 clay is that they can be recovered and reused efficiently. After the reaction was over (TLC), the resulting solid was filtered, recovered catalyst was thoroughly washed with ethyl acetate, air dried, activated at 80°C for 2 h and reused for successive runs Fig 3. Hence, the catalyst exhibited high activity up to six reuses with only a marginal decrease in the yield which may be caused from the loss of catalyst during recycling or adsorption of organic products over the catalyst by poisoning their active sites. This catalyst exhibited high potential by maintaining its activity while recycling experiments. All the products 4(a-f) were crystalline and characterized based on their melting points, elemental analysis, and spectral data (NMR).

**Table 2: Screening of scope of substrates**
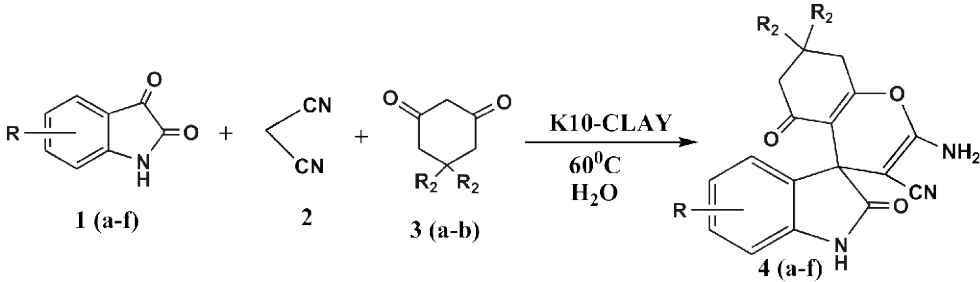
| Product | $R_1$ | $R_2$ | Time (h) | Yield[a] (%) | Mp (lit)$^0$C[b] |
|---------|-------|-------|----------|--------------|-------------------|
| 4a | H | $CH_3$ | 3 | 90 | 290-291 |
| 4b | 5-$CH_3$ | $CH_3$ | 3 | 92 | 279-281 |
| 4c | 4-Br | $CH_3$ | 3.5 | 94 | 295-296 |
| 4d | 7-Cl | $CH_3$ | 3.5 | 94 | 291-293 |
| 4e | 5-$NO_2$ | $CH_3$ | 3 | 89 | 280-281 |
| 4f | H | H | 3 | 90 | 251-253 |

[a] Isolated yield, [b] Ref no. 13

The most probable mechanism of this reaction includes a fast Knoevenagel
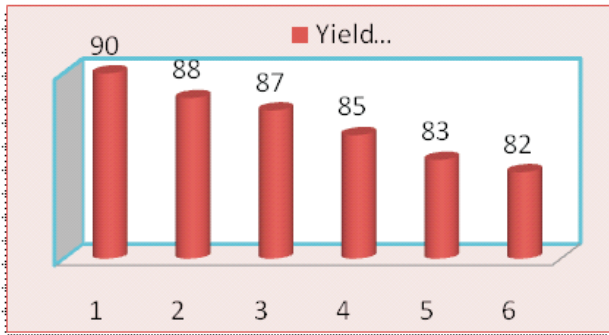
**Fig 3: Recyclability of K10 clay in the synthesis of spirooxindole**
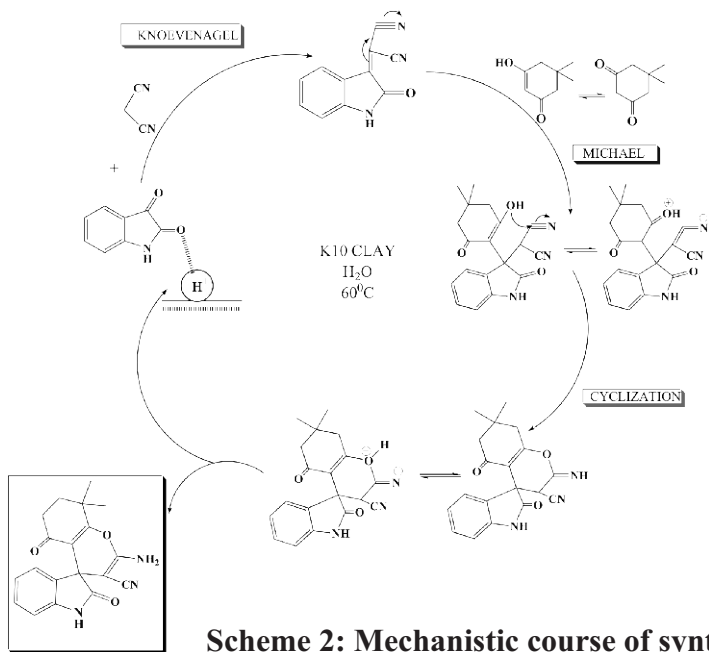


**Scheme 2: Mechanistic course of synthesis of spirooxindole**

**Table 1. List of fungicide, active ingredients and their dose**

| S.No | Fungicides | Active ingredients | Dose (%) |
|------|-----------|--------------------|----------|
| 1 | Carbendazim | Methyl 1-2 Bezimidazole carbamat | 0.1 |
| 2 | Matco | Metalaxyl + mancozeb | 0.2 |
| 3 | Chlrothalonil | Tetrachlorosoisophthalonitrite | 0.2 |
| 4 | Roko | Thiophanate methyl 70%wp | 0.2 |
| 5 | Mancozeb | (Ethylene bisdithio-carbamate) | 0.2 |
| 6 | Acrobet | Dimethomorph 50%wp | 0.2 |
| 7 | Azoxystrobin | Methyl (2E)-2-E(6-2-cynophenoxy)Pyrimidin-4-yl]oxyz phenyl)-3-methoxyacrylat | 0.3 |
| 8 | Curzate | Cymoxanil 8% + mancozeb 64% | 0.2 |
| 9 | Antracol | Propineb 70% a.i | 0.1 |
| 10 | Ridomil | [Methyl-DL-N(2,6,dimethylphenyl-N)2 methoxyacetyl-alaninate]+Manganous zinc ethylenebisdithiocarbamate | 0.2 |
| 11 | Tilt | 1-L 2 -(2,4-dichlorophenyl)-4-Propyl-1,3 dioxalan -2yl-methyl-IH-1,2,4-triazole | 0.1 |

sterilized potato dextrose medium and shaken well to make it homogenous. These fungi toxicants were impregnated in medium then poured in 85 mm sterilized petridishes with three replication for each treatment and allowed to solidify. These dishes were then inoculated with 5 mm circular disc of inoculums taken from 10 days old culture and these discs were placed in the center of each petriplate in such a way so that fungus may come in direct contact with the medium. The medium without any fungi toxicants poured and inoculated similarly which served as control. The petridishes were incubated at $28\pm1^0$C for 7 days. The efficacy of

# *IN -VITRO* EVALUATION OF SAME CHEMICAL FUNGITOXICANT AGAINST *COLLETOTRICHUM LINDEMUTHIANUM*(SACC.& MAGN.) CAUSING ANTHRACNOSE OF FRENCH BEAN.

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## ABSTRACT

**Carbendazim and Azoxystrobin were found mote effective fungitoxicants and they inhibited the fungal growth up to 100 percent followed by Mancozeb (98.58%), Roko (92.52%), Chlrothalonil (89.89%), Matco (87.82%), Tilt (87.25%), Ridomil (85.54%), Acrobet (78.70%), Curzate M-8 (75.99%) and Antracol (67.73) repectively.**

*Key words :* Fungitoxicant, french bean, anthrachose.

French bean *(Phaseolus vulgaris* L*.)* commonly known as kidney bean, haricot bean and Rajmash, has prime importance as pulse as well as vegetable. French bean occupies an area of 4268 ha with 24778 tonnes production with is 5.80 tonnes/ha productivity in India**.** (F.A.O,1998). The fungal diseases are considered to be the major factors responsible for lowering down the yield and quialty both. During the recent surveyes it was observed that the incidence of anthracnose of French bean is increasing year after year in U.P. Anthracnose, derived from a Greek Word Meaning "Coal", is the common name for plant disease characterized by very dark, sunken lesions, containing spores (Isaac,1992). Therefore the proper attention is necessary to control this melody. Considering the importance of the crop and the destructive nature of the disease an experiment was conducted on the evaluation of some chemical fungitoxicants against pathogen *invitro* with the objective to findout the suitable chemicals for the management of the disease.

## MATEREALS AND MATHODS

Eleven chemical fugitoxicants namely Carbendazim, Matco, Chlrothalonil, Roko, Mancozeb, Acrobet, Azoxystrobin, Curzate, Antracol, Ridomil and Tilt were used.

Poison food technique devised by Schmitz (1930) was follows for screening the fungi toxicants. The requisite quantities of the fungi toxicants were incorporated in 2 per cent

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## CONCLUSION

Majority of the respondents had medium level of knowledge as well as medium skill level about all four activities which they have received training. Maximum respondent had general high income by tailoring where as maximum respondent had generated low income by value addition of guava. It may be concluded the tailoring have been the best enterprise for tribal farm women in terms of income generation.

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**Distribution of respondent according to their income generation all four activities**
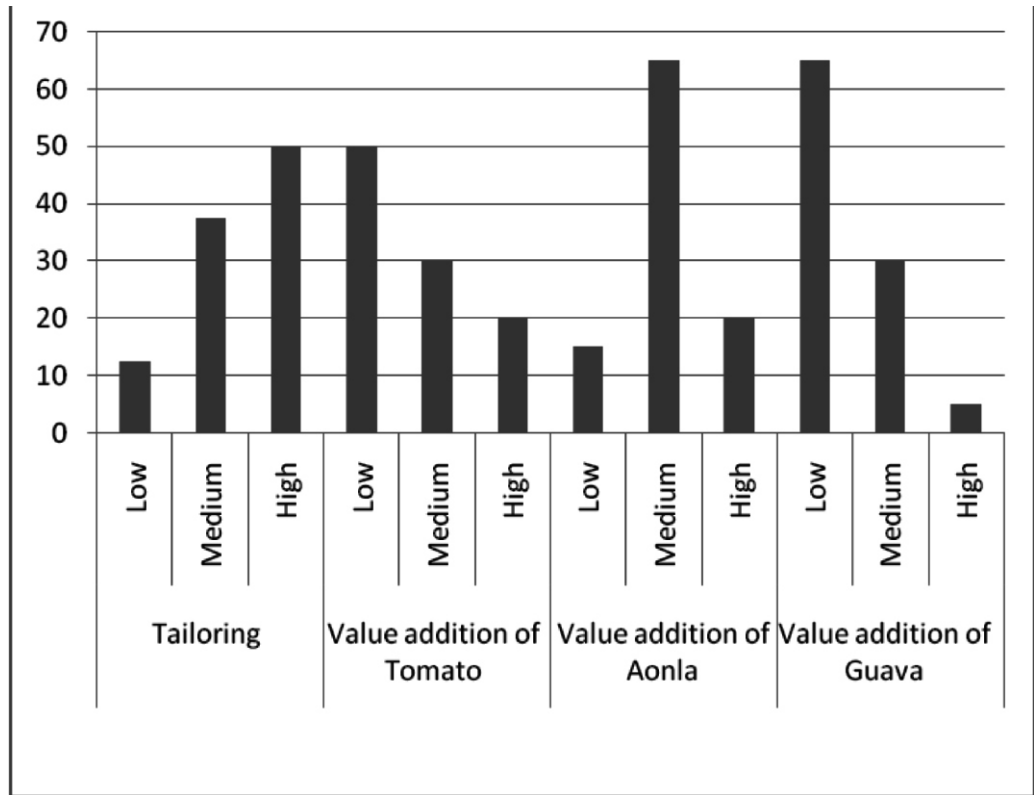


**Impact of vocational training programme on income generation.**

It was observed that from out of all four activities, maximum average income was generated through tailoring (Rs 6510), followed by value addition of aonla (Rs 4000), by value addition of guava (Rs 3900) and from value addition of tomato (Rs 3100).

**Table 4. According to their average income generation by all four activities**

| Activities | Average income generated (Rs.) | Rank |
|---|---|---|
| Tailoring | 6510 | I |
| Value addition of Aonla | 4000 | II |
| Value addition of Guava | 3900 | III |
| Value addition of Tomato | 3110 | IV |

# COMPARATIVE PERFORMANCE OF SYSTEM OF RICE INTENSIFICATION (SRI) IN DISTRICT CHANDAULI (U.P.)

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**ABSTRACT**

The trials on comparative performance of system of rice Intensification (SRI) were conducted during Kharif 2008 and Kharif 2010 at two locations viz. instructional farm of the Krishi Vigyan Kendra and farmer's fields in district Chandauli (U.P.). The results reveal that SRI technology showed significantly better performance on the basis of the plant characters, yield attributes and economics /net profit in comparison to farmer's practice (non-SRI) at both the locations during experimentation.

Rice (Oryza sativa L) crop is a big guzzler of water which consumes half of all fresh water resources. Water requirements of rice are 2 to 4 times more than that of the other crops of the same duration because of water loss by percolation, seepage and field preparations etc. under submerged conditions (Sita Devi and Ponnasari, 2009).Water has become a scarce resource in India as well as in the World. Current use of water in India is 83 per cent in agriculture sector, 12 per cent in industries sector and 5 per cent in domestic sector. Per capita availability of water in India is gradually reduced from 1820 $m^3$ per year in 2001 to 1341 $m^3$ per year by 2025 (GOI,2009).To ensure food security in rice consuming countries .

1-KVK Panti, Ambedkar Nagar 224168 UP INDIA, 2-KVK Tisuhi ,Sonbhadra UP INDIA, 3-KVK Haidergarh, Barabanki UP INDIA , 4-ATMA Ambedkar Nagar- 224122 UP INDIA of the world, rice production would have to be increased by 50 per cent of these countries by 2025 and this additional yield will have to be produced on less usage of water, labour and chemicals (Zeng *et al*. 2004).Also, the main threats to the future food security are shrinking land ( reducing farm size and area),depleting water resources ,declining trends in soil fertility and productivity as well as depletion of ground water table (Sita Devi and Ponnasari,2009). Therefore, there is a need to find ways and methods of efficient utilization of scarce water resources for rice cultivation and System of Rice Intensification(SRI) is one of the possible solutions to the future perspectives i.e. water scarcity problem and efficient utilization of limited water.

**MATERIALS AND METHODS**

System of rice intensification (SRI) is a production method centered on increasing the

yield of irrigated rice production (now used for rain-fed also) without relying on purchased inputs or with minimum inputs. The trials were conducted with two genotypes / varieties viz. HYV: BPT 5204 (G1) and Hybrid: RPH 6 (G2) and two treatments viz. SRI technology and Farmer's practice ( non-SRI ) method as well as two locations viz. Instructional farm of the KVK and Farmer's fields in District Chandauli (U P).As per recommendations of SRI, each and every step followed such as (i) 10 days old seedlings for transplanting (ii) one seedling per hill (iii)25 x 25 cm spacing for transplantation with the help of marker (iv) 4 times weeding at 10 days interval starting from 10 days after transplanting and (v) intermittent irrigation till flowering with 2-3 cm water from flowering to grain filling stage. Farmer's practice (non-SRI method) represents transplanting of more than 21 days old nursery at randomly with 3-5 seedlings per hill at close spacing. Preparation of main field in SRI was the same as traditional method. The fields should be level and there should be no standing water while transplanting. If needed, canals should be prepared for irrigation or drainage in SRI plots. The area of trial was 1000 square meters each in SRI technology and Farmer's practice (non-SRI) at both the locations during experimentation. The observations on plant characters such as plant height (cm), root spread (cm), root depth (cm), root biomass (cc), number of tillers per hill, number of spikes per hill, spike length (cm), number of days to 50 per cent flowering and yield attributes i.e. number of grains per spike, test weight (g per 100

grains) and grain yield (Kg per hectare) as well as Economics/ net profit (Rs per hectare) recorded and presented as per guidelines of Uttar Pradesh council of Agricultural Research (UPCAR), Lucknow.

## RESULTS AND DISCUSSION

The data on comparative performance of system of rice Intensification (SRI) were recorded at two locations viz. Instructional farm of the KVK and Farmers fields in District Chandauli (U.P.) during kharif 2008 and 2010. (Table 1) The observations of plant characters such as plant height ,root spread, root depth ,root biomass, number of tillers per hill, number of spikes per hill ,spike length ,days to 50 per cents flowering showed that all the parameters significantly performed better in SRI technology than conventional method (farmer's practice) . The Yield attributes of rice production namely number of grains per , spike , test weight and grain yield were also improved in SRI technology in comparison to non- SRI method.. Likewise, the Economics in terms of net profit was comparatively higher in SRI technology than traditional rice production method at both the locations during Kharif 2008 and 2010 , respectively. The report of Sita Devi and Ponnasari (2009) is in agreement with present findings. The better performance of plant characters ,yield attributes and economics / net profit in SRI technology is obviously better due to the combined effects of the technology component such as maintain the soil fertility level with organic manure (15 ton per hectare FYM / compost prior to 7-10 days of

**Distribution of respondent according to their skill level in all four activities**
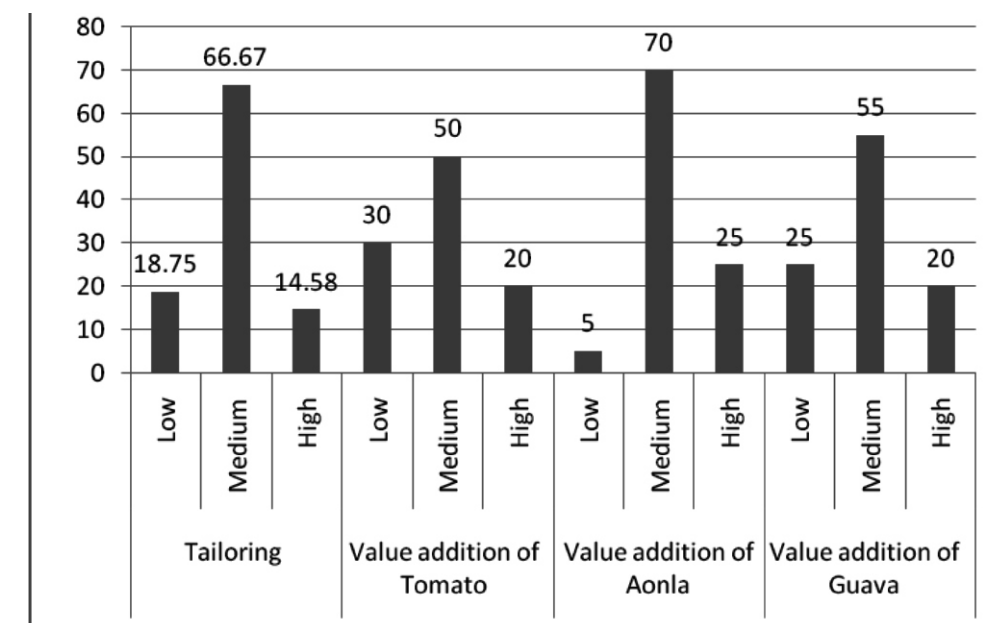


**Impact of vocational training programme on Income**

Out of 48 respondents, 50 % had generated high income, 37.5 % had generated medium income and 12.5 % had generated low income from tailoring. From out of 20 respondents, 50% of respondents had generated low income, 20% respondent had generated high income and 30 % respondent had generated medium income by value addition of tomato. From out of 20 respondents, 65% respondents had value addition of aonla and maximum respondent had generated medium income by value addition of guava. It may be concluded the tailoring have been the best enterprise for tribal farm women in terms of income generation.

**Table 3**. **Income level in all four activities**

| Activities | Knowledge | No. of respondent | Percentage |
|---|---|---|---|
| Tailoring | Low | 6 | 12.5 |
| | Medium | 18 | 37.5 |
| | High | 24 | 50 |
| Value addition of Tomato | Low | 10 | 50 |
| | Medium | 6 | 30 |
| | High | 4 | 20 |
| Value addition of aonla | Low | 3 | 15 |
| | Medium | 13 | 65 |
| | High | 4 | 20 |
| Value addition of guava | Low | 13 | 65 |
| | Medium | 6 | 30 |
| | High | 1 | 5 |

**Distribution of respondent according to their gain in knowledge level in all four activities**
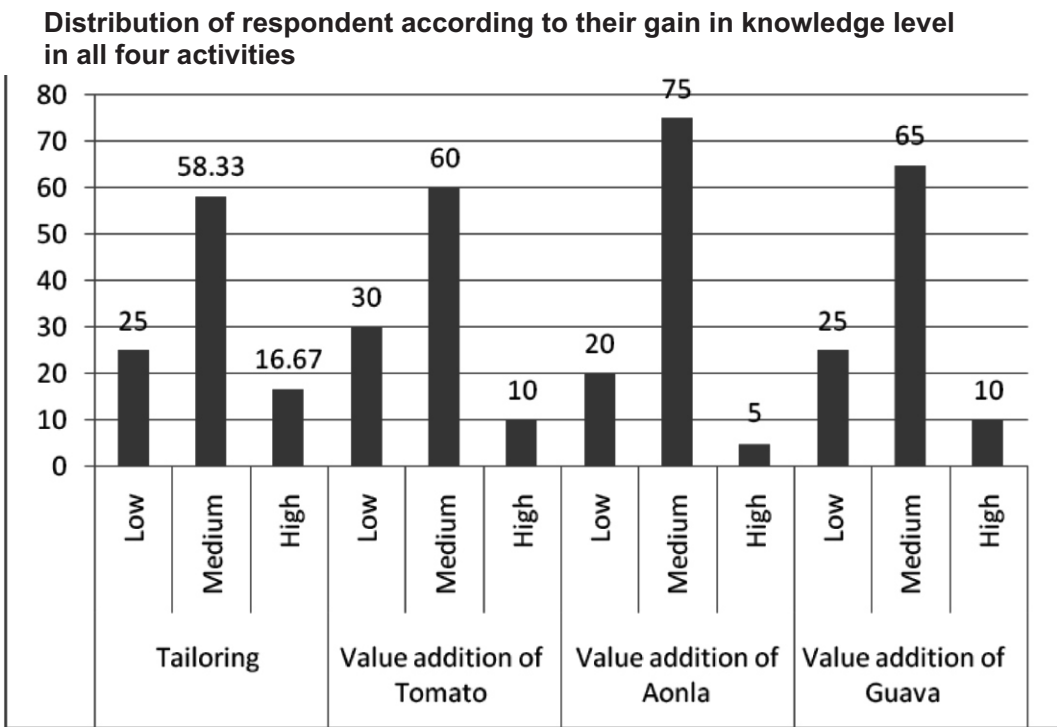
**Impact of vocational training programme on skill development**

Among participants 66.67% had medium level, 18.75% had low and 14.58 % had high skill level regarding tailoring, 50% had medium skill level, 30 % had low, 20% respondent had had high skill level regarding value addition of tomato. For value addition of aonla 70% had medium level, 5% had low and 25 % had high skill level where as value addition of guava 55 % had medium level, 25% had low and 20 % had high skill level.

**Table 2. Distribution of respondent according to their Skill level**

| Activities | Knowledge | No. of respondent | Percentage |
|---|---|---|---|
| Tailoring | Low | 9 | 18.75 |
| | Medium | 32 | 66.67 |
| | High | 7 | 14.58 |
| Value addition of Tomato | Low | 6 | 30 |
| | Medium | 10 | 50 |
| | High | 4 | 20 |
| Value addition of aonla | Low | 1 | 5 |
| | Medium | 14 | 70 |
| | High | 5 | 25 |
| Value addition of guava | Low | 5 | 25 |
| | Medium | 11 | 55 |
| | High | 4 | 20 |

field preparations and mixed into the soil) , transplantation of young seedling of 10 days age and one seedling per hill at 25*25cm with the help of marker,4 times application of conoweeder for turning back the weeds in to the soil with the objective of more aeration to plant roots resulting in their healthy growth as well as intermittent irrigation till flowering and 2-3 cm water availability during flowering to grain filling stage with application of Neem cake @100 kg per hectare for reducing the harmful insect –pests and diseases below economic thresh-hold level in SRI plots.

**Table 1: Comparative performance of System of rice intensification (SRI) in District Chandauli (U.P.) during Kharif 2008 and Kharif 2010.**

| Sr.no. | Observations | SRI v/s Farmer's Pactice (Non- SRI) | KVK instructional farm | | | | Farmer's field | | | | Overall average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HYV (BPT-5204) | | Hybrid (RPH-6) | | HYV (BPT-5204) | | Hybrid(RPH-6) | | |
| | | | Kharif 2008 | Kharif 2010 | Kharif 2008 | Kharif 2010 | Kharif 2008 | Kharif 2010 | Kharif 2008 | Kharif 2010 | |
| 1. | Plant height (cm) | SRI | 87.07 | 68.20 | 90.33 | 82.24 | 84.64 | 67.76 | 93.00 | 82.23 | 81.93 |
| | | Non-SRI | 75.33 | 66.26 | 89.82 | 79.07 | 81.33 | 66.65 | 91.66 | 79.26 | 78.68 |
| 2. | Root Spread (cm) | SRI | 23.14 | 20.41 | 24.54 | 22.43 | 22.45 | 22.33 | 23.62 | 22.48 | 22.68 |
| | | Non-SRI | 18.10 | 20.29 | 22.76 | 21.65 | 21.28 | 18.42 | 19.51 | 20.41 | 20.30 |
| 3. | Root Depth(cm) | SRI | 26.36 | 23.32 | 27.39 | 26.66 | 24.68 | 23.40 | 25.52 | 24.61 | 25.24 |
| | | Non-SRI | 21.93 | 22.38 | 26.18 | 23.89 | 23.79 | 21.65 | 17.75 | 22.84 | 22.55 |
| 4. | Root Biomass (cc) | SRI | 29146.40 | 30638.00 | 34368.30 | 42260.00 | 30533.70 | 37062.00 | 32358.00 | 39095.00 | 34432.67 |
| | | Non-SRI | 21383.30 | 28928.00 | 30744.00 | 35151.00 | 26878.60 | 23099.00 | 27629.00 | 39095.00 | 29113.41 |
| 5. | Number of tillers / hill | SRI | 58.00 | 55.33 | 35.33 | 36.00 | 54.33 | 58.33 | 37.33 | 36.33 | 46.37 |
| | | Non-SRI | 52.00 | 51.33 | 35.33 | 36.00 | 54.33 | 58.33 | 37.33 | 36.33 | 45.12 |
| 6. | Number of spikes/ hill | SRI | 55.00 | 55.33 | 35.33 | 35.67 | 54.33 | 57.33 | 37.00 | 36.00 | 45.75 |
| | | Non- | 51.00 | 51.00 | 33.33 | 33.33 | 43.33 | 52.00 | 32.00 | 31.67 | 40.96 |

| 7. | Spike length(cm) | SRI | 53.00 | 50.76 | 67.62 | 64.20 | 53.86 | 50.47 | 66.45 | 62.78 | 58.64 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Non-SRI | 49.51 | 47.88 | 65.69 | 61.52 | 51.08 | 47.54 | 57.82 | 59.52 | 55.07 |
| 8. | Days to 50% flowering | SRI | 95.67 | 93.00 | 63.33 | 64.00 | 91.67 | 93.33 | 63.00 | 68.67 | 79.08 |
| | | Non-SRI | 104.67 | 95.00 | 65.33 | 67.00 | 94.00 | 95.67 | 75.00 | 70.00 | 83.33 |
| 9. | Number of grains / spike | SRI | 289.00 | 315.67 | 333.00 | 276.67 | 263.67 | 285.00 | 328.00 | 267.00 | 295.00 |
| | | Non-SRI | 264.00 | 300.67 | 315.67 | 273.33 | 256.00 | 268.00 | 318.33 | 253.67 | 281.20 |
| 10. | Test weight (g / 100 grains) | SRI | 17.45 | 19.35 | 25.03 | 21.29 | 17.36 | 20.80 | 26.20 | 22.24 | 21.22 |
| | | Non-SRI | 17.16 | 17.52 | 24.15 | 16.31 | 17.18 | 17.79 | 26.13 | 17.39 | 19.20 |
| 11. | Grain yield ( Kg / ha) | SRI | 5781.03 | 5902.72 | 7317.90 | 6372.62 | 5792.21 | 6251.01 | 7244.63 | 6622.62 | 6410.59 |
| | | Non-SRI | 5116.31 | 5159.66 | 6530.86 | 6229.12 | 5078.42 | 5339.79 | 5631.94 | 5264.76 | 5543.85 |
| 12. | Economics in terms of Net Profit (Rs / ha) | SRI | 24618.00 | 36277.00 | 37682.00 | 41117.00 | 24714.00 | 39865.00 | 36976.00 | 43692.00 | 35617.62 |
| | | Non-SRI | 18971.00 | 26048.00 | 30992.00 | 28624.00 | 18046.00 | 29706.00 | 23351.00 | 30479.00 | 25777.12 |

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method. A total sample of 108 was selected for data collection. A structured interview schedule was framed through which primary data was collected, the rural women are often illiterate and do not respond to questionnaire technique properly, therefore, interview and observation method was used. The structured interview schedule prepared was pre-tested on 10 percent of the respondents to find out any ambiguity and its work ability before final use. The data collected has been carefully scrutinized and condensed into master chart and tabulated in terms of statistical tools to represent in a meaningful way. The data in the form of numerical value were categorized. Frequencies and percentage were worked out using the following formula.

where, P = percentage

X = Frequency of respondents

$$P = \frac{X}{N} \times 100$$

**Table 1. Distribution of respondent according to their knowledge level**

| Activities | Knowledge | No. of respondent | Percentage |
|---|---|---|---|
| Tailoring | Low | 12 | 25 |
| | Medium | 28 | 58.33 |
| | High | 8 | 16.67 |
| Value addition of Tomato | Low | 6 | 30 |
| | Medium | 12 | 60 |
| | High | 2 | 10 |
| Value addition of aonla | Low | 4 | 20 |
| | Medium | 15 | 75 |
| | High | 1 | 5 |
| Value addition of guava | Low | 5 | 25 |
| | Medium | 13 | 65 |
| | High | 2 | 10 |

only but women should remember that they are rational, intelligent and thinking human beings. Dependent women are not empowered women. If women think just that being highly educated and employed they are empowered, it is a myth (Banga 2010). Empowerment is the power of obtaining basic opportunities for women, either directly by those people or through the help of welfare organizations. It also includes encouraging and developing the skills for self-efficiency.

The concept of vocational training generates with the need of empowerment of farm women in forms of knowledge gain , skill development and income generation. Vocational training refers to a certain type of training whose main objective is preparing people for work. Vocational training for the farmers proves to be a significant input in accelerating farm production. Different attempts are being made to make rural women self sufficient through various training programmes. A study on impact of tailoring training programme on rural women of Dharwad district of Karnataka and reported that 68 per cent of trained women belonged to age group of above 22 years (Mahale et. al. 1991). Women can do a better job of vegetable production if they are provided with proper training, suitable technological package and with proper inputs (Ahmad et. al. 2007).

The impact assessment is a generic term that includes social, human, technological and psychological impact assessment (Dipak and Basavaprabhu 2005). It also refers to the outcome of the results of activities and net effect of activities on economic and social status. Impact of vocational training courses can be carried out after, during or before implementation of the developmental programmes referred to as retrospective, programmes.

Krishi Vigyan Kendra Shahdol (M P) has successfully organized different types of vocational training for farm women in agriculture and allied field. Between the years 2010 to 2013, the vocational training organized for tribal farm women was:

(a) Tailoring. (b) Value addition of tomato, (c) Value addition of aonla and (d) Value addition of guava

The study was undertaken with the following objectives: i) To find out the increase in the knowledge level of trainees covered under vocational training courses. ii) To find out the increase in the skill level of trainees covered under vocational training courses. iii) To study the increase in income level of trainees covered under vocational training courses.

## MATERIALS AND METHODS

The study was undertaken with an attempt to know the impact of vocational training courses conducted by KVK Shahdol (M.P.) on the knowledge, skill and adoption level of rural women. The sample group for the present study comprised only of tribal farm women trained through various vocational training programmes. A sample of 50% of the total women beneficiaries covered under different vocational training courses in the KVK's was selected by random sampling

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# VISUAL PROCESSING OF MULTI-SPECTRAL SATELLITE IMAGES FOR INVENTORY OF INLAND WETLANDS

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## ABSTRACT

**Realizing the importance of wetlands in environment, a study was taken up to generate geospatial information on wetlands in a part of Sultanpur district (Gauriganj block ,lies between $26^0 06'25''$ to $26^0 19'57''$ N and longitude $81^0 36'18''$ to $81^0 47'27''$E; area- 20786.10 ha.), Uttar Pradesh, India, using IRS-P6-LISS-III data (path-101, row-53, Band -Green, Red, NIR and SWIR, March and October, 2010)  and Geographic Information System (GIS). The satellite data for both pre and post monsoon seasons were processed in ARC VIEW 3.2a and ERDAS IMAGINE, 9.1 software. Systematic Visual Image Processing approach was adopted in identification and mapping of wetlands. Four categories of wetlands viz.,ponds/lakes, swampy/marshy area, water logged area(permanent) and water logged area (seasonal) were identified. The analysis reveals that, the wetlands constitute 11.61 % (2430.81 ha.) of the study area, of which 70.88 % is subjected to water logging .The study also highlights the usefulness of remote sensing data and GIS in conservation and management of wetlands.**

**Key words:** Wetlands, Geospatial information,

IRS-P6-LISS-III data, Arc view 3.2a, ERDAS Imagine 9.1, Systematic visual image processing approach

Wetlands are critically important ecosystems that maintain the environmental stability in the world where environmental degradation is increasing day by day (Manju et al.,2005).They provide various significant socio-economic and ecological benefits in any region(Hollis and Acreman,1994). Despite these proven advantages, wetlands have long suffered significant losses and continue to face an on-going conversion threat from increasing anthropological pressure in India. To take any decision regarding wetland management or in derive any policy to conserve this scare ecosystem, the first and foremost task is to make an inventory of its spatial extent. Absence of reliable and updated information and data on extent of wetlands, their conservation values and socioeconomic importance has greatly hampered development of policy, legislation and administrative interventions by the state. Hence & spatial information on wetlands is a critical and an urgently needed for an effective wetland conservation planing.

The recent development in remote sensing and GIS technologies are providing valuable tools for the inventory, monitoring

and management of wetlands. Remote sensing technologies provide the means to map the characteristics of an area and monitor its condition at regular intervals, from the space. The GIS helps in performing various kinds of analysis due to its ability to collect, store, manipulate and integrate various types of data in unique spatial database. In the some of the earlier studies, remote sensing techniques were used for deriving information on quantities and qualitative status of the wetlands (Weismiller et. al., 1977; Klemas et. al.,1980; Carpenter and Carpenter,1983; Murthy et al.,1988;Palria et. al.,1994; Wani et al.,1996; Chopra et al.,1999). Most of these studies have focused on individual wetlands. Thus, an overall estimate of condition of wetlands over a large area is useful for their conservation. Garg et al.(1998) have carried out study to delineate wetlands of a number of district across india using IRS 1A/B LISS I/II data. This study was carried out on a large scale,only the wetlands of area greater than 56 ha. were mapped on 1:250,000 scale.However, an overall estimate of condition of wetlands over a large area at higher resolution is useful for wetland management. Realizing the environmental importance of wetlands , preseant study was taken up with the specific objective of generating geospatial information on inland wetlands selecting a part of Sultanpur district (Gauriganj block) Uttar Pradesh, northern India, using IRS-P6-LISS-III data and Geographic Information System (GIS). This study may prove a better input in wetland conservation and management in the study area.

## MATERIALS AND METHODS
### Study area

The study area has been undertaken in Gauriganj block (falls between latitude, $26^0 06'25''$ to $26^0 19'57''$ N and longitude $81^0 36'18''$ to $81^0 47'27''$ E) of Sultanpur district which lies in middle Ganga plain in the eastern part of the Uttar Pradesh, India. It covers an area of 207.86 km$^2$ , characterized by an even and featureless plain, composed of deep and fertile alluvium deposited by the Ganga River and its tributaries. The area enjoys the typical tropical, semiarid, monsoonal type of climate characterized by a dry and hot spring/early summer, a hot rainy season, a warm autumn and a cool winter (Mishra and Sharma, 2003). The average annual rainfall is 977 mm, mainly received between July and September (Sharma et al., 2001). The winter rains are irregular and scanty. The mean maximum and minimum annual temperatures are $47.5^0$ C and $4.1^0$C respectively. The soils of the study area have been classified as Aquic Petrocalcic Natrustalf (Soil Survey Staff, 1994) and represent a large area of man induced salt affected lands occurring in the Ganga alluvial plains. The total population of the area (120892 in 2001 census) distributed in 102 revenue villages. The block is economically backward and majority of the population (78.50 % of the working force) earns livelihood from agriculture and allied activities. The land degradation is one of the

# IMPACT OF VOCATIONAL TRAINING PROGRAMME ON KNOWLEDGE, SKILL DEVELOPMENT AND INCOME GENERATION OF TRIBAL FARM WOMEN OF SHAHDOL DISTRICT OF MADHYA PRADESH

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## ABSTRACT

**The aim of this study is to assess the impact of vocational training courses on knowledge, skill and income level of tribal farm women in Shahdol ( M.P.). The study sample comprised of 108 tribal farm women beneficiaries who had under gone various vocational training courses to ascertain the impact of training courses for the empowerment of rural women in Shahdol during the year 2010- 2013. The study revealed that majority (64.58%) of the respondents had medium level of knowledge as well as maximum respondents has (60.42%) medium skill level about all four activities which they have received training. Maximum average income generated by tailoring (i.e. Rs 6510) and minimum income generated by value addition of tomato (i.e. Rs 3100/-) . The training of tailoring , value addition of fruits and vegetable preservation work by the trainees had increased their socio - economic status.**

Farmwomen experience high exploitation due to economic dependence. Emancipation of women, especially in socio-economic terms, is an essential pre-requisite for economic development and social progress. Economic independence of women creates far reaching social changes empowering them to face injustice and discrimination ( Santhi and Muthu 2005).

The process of empowerment is conceptualized in terms of personal assertions and confidence ability to protect themselves as women, attaining economic independence, ownership of productive assets ability to handle capital and assets and provide leadership in both women and community of all levels. Empowerment is a process of awareness and capacity building, leading to a greater participation and greater decision making power. The process of empowerment strengthens their innate ability through acquiring knowledge, power and experience (Murugan and Dharmalingam 2000). To raise the status of women, they must be empowered socially, economically and politically. Empowerment can serve as a powerful instrument for women to achieve upward social and economic mobility and to achieve power and status in the society. Empowering women does not mean empowering in technical area

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major environmental problems.

**Data used**

Data and research tools used in the study are-(i) Two seasons (Pre monsoon and post monsoon) multi-spectral satellite data of IRS P6,LISS III(Band 2:0.52 - 0.59 μm ,Band 3: 0.62-0.68 μm ,Band 4: 0.77-0.86 μm; spatial resolution 23.5 meter) acquired on March 15,2010 and September 07,2010 (ii) Survey of India topographic maps (number -63 F/11, 63 F/12 and 63 F/ 16) on 1:50000 scale. (iii) Village boundary map of the block, NNRDMS, Sultanpur (iv) Ground truth information collected through field visit in the month of March, 2013 and September, 2013 (v) Census data, 2001, NIC, Sultanpur ((vi). ERDAS IMAGINE 9.1 (Leica Geosystems ,Atlana,U.S.A.) and ARC VIEW version 3.2a (ESRI) GIS   packages (vii) Garmin GPSmap 76 Cx, (Garmin Taiwan).

The IRS P6, LISS III satellite images of 15th March, 2010 and 07th September, 2010 were selected to represent pre monsoon (2010) and post monsoon (2010) seasons respectively. These data sets were imported in digital image processing software ERDAS IMAGINE 9.1 and geometrically corrected through image to image registration at accuracy of less than 0.2 pixels using a second order polynomial transformation. The images were resampled using nearest neighbor interpolation and assigned polyconic projection, spheroid and Everest datum for standard geographic latitude and longitude coordinated system. The whole study area was extracted through the sub-

setting of area of interest. The standard false colour composite (FCCs) were generated for the study area through layer stack option in Image Interpreter tool box. The digitally registered FCCs images of the study area were subsequently analyzed to generate wetland map. The identification and mapping of different wetland classes during pre and post monsoon seasons were performed employing on-the-screen visual image interpretation in ARC VIEW 3.2a software. The standard FCCs images for both seasons were annotated for identification and delineation of wetland classes and important points for reference with the help of toposheets. A general traversing of the area was undertaken and some observations were recorded at few places. A legend was formed to identify the tonal behavior of major wetland types of the imagery. The tone and texture of wetlands were recorded. Based on the image characteristics and tonal behavior, all scenes were visually interpreted on computer screen for a tentative map of wetlands of the study area. Three classes of wetlands were identified and mapped on satellite image viz. ponds/lakes, swamp/marsh, water logged area and drains.

The ground truth were collected from selected sample ground points through field visit in months of March (2013) and September (2013) for validating interpreted information on satellite images. The Garmin GPS map 76 Cx, (Garmin Taiwan) was used during field work for locating field check points. A final

correlation was established by incorporating the finding of ground truth validation analysis, and final maps were prepared. In order to evaluate accuracy of interpreted land use/land cover and cropland maps, randomly sampled 120 points on reference image were selected and analyzed in ERADAS IMAGINE software using accuracy Assessment option in the classification dialog. The classified layers were compared with ground truth data and Google earth high resolution image (source- http //www. Google earth.com) and an error matrix was prepared. The both thematic maps were analyzed in ARC View 3.2a software to calculate cropping intensity and other statistics.

## RESULTS AND DISCUSSION

Spatial distribution of wetlands in a region is an outcome of both natural and anthropogenic factors. Satellite remote sensing plays an important role in generating information about the existing spatial pattern of wetlands in an area and its temporal changes through times. RS is one of the effective tools that can provide precise and up-to-date information on the wetland ecosystem. Two seasons (pre monsoon and post monsoon) data of Indian Remote Sensing Satellite IRS P6, LISS III were used for the generating wetland map in the core of GIS. Ground truth data collected through field visit were also integrated in wetland inventories of the pre monsoon and post monsoon seasons. The identification and mapping of wetlands in the study area was based on national wet land classification system (Anon,1994). The wetlands map obtained from the satellite data is shown in fig.1, and relevant statistics are given in table-1. Mainly four types of wetland classes are present, in the study area viz. (i) lake/pond (ii) swampy /marshy area (iii) water logged area (permanent) and (iv) water logged area (seasonal) . The accuracy analysis reveals
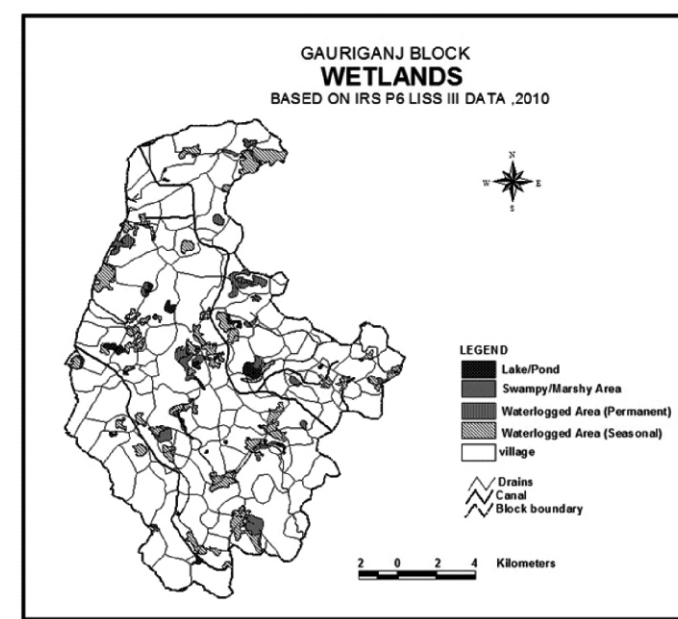


Fig .1

(*Melanotaenia duboulayi*). *Environ. Toxicol. Chem*. 17: 1799 – 1806.

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Similarly increased defecation and mucus secretion observed in the present study are the typical reflection of organophosphate toxicity involving hyper stimulation of muscarinic receptors in the smooth muscles of end organs *viz* gastrointestinal tract and secretory glands (Bonita, 2004).

Therefore, it is concluded that dimethoate is more toxic to common carp at higher temperatures and triggers many behavioral abnormalities which are more pronounced in the summer months.

**Table 3. Behavioral parameters altered in exposed fishes in the two months**

| Behavioral Parameters | August | December |
|---|---|---|
| Excited state | subsides within 1 - 2 h | subsides within 1 h |
| Schooling | remains disrupted during exposure | similar |
| Swimming pattern | abnormal, erratic and jerky | similar |
| Surfacing | increased during first two h | continues longer |
| Coughing | frequent | very frequent |
| Opercular rate | slowed | similar |
| Response to touch | slow | very slow |
| Mucus secretion | increased considerably | increased tremendously |
| Defecation | increased considerably | little increase |
| Body color | changes from silvery to pale | little change |

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**Table 1. Wetlands in Gauriganj block (Derived from Satellite images)**

| Sl.No. | wetlands | Area (Ha.) | Area (% of to total area) |
|---|---|---|---|
| 1 | Lake/Pond | 244.17 | 1.17 |
| 2 | Swampy /Marshy area | 463.64 | 2.24 |
| 3 | Water logged area (permanent) | 247.45 | 1.19 |
| 4 | Water logged area (seasonal) | 1475.55 | 7.09 |
| | **Total area of the block** | **20786.10** | **100.00** |

89.16 per cent average accuracy, 95.72 per cent overall accuracy, and 0.935 Kappa coefficient values for March, 2010 data and 91.45 per cent, 92.43 per cent and 0.952 respectively, for September, 2010 data.

\ The total area of the block, derived after digitization the base map using ARC View 3.2a GIS, work out to be 20786.10 ha. The most prominent inland wetland class found in the study area is the waterlogged areas. The inland wetlands together constitute 11.61 % (2430.81 ha.) of the area, of which as much as 70.88 % (1723 ha) comes under water logged areas. This shows that water logging is a significant problem in the study area, which may be due to the fact that the terrain is mostly plain. Further, the water logging is mapped using the pre and post monsoon data of the study area. The water spread is then examined using the pre and post monsoon data of the study area. Permanent and seasonal water logged area occupies on 1.19 per cent (247.45 ha.) and 7.09 per cent (1475.55 ha.) of the total geographical area respectively. The permanent water logged area can be clearly observed on both satellite imageries of pre and post monsoon season. It was observed in Gulalpur, Benipur Baldev, Tulsi Pur, Sujapur, Gauri Pur, Jagdishpur, Ana pur,Barna Tikar, Raj Garh, and Misrauli villages. Seasonal water logged area was mapped on only post monsoon period satellite image. About 62 villages of the study area were affected by seasonal water logging. (Table -2).

Development of Swampy/Marshy terrain is related to development of alluvial plains. Most of the sediment transported by river is deposited near banks on either side of river in the form of natural levee. The blocking of the passage of drains and low lying area filled with silt and mud on back of levee. Slowly rivers migrate away and leave behind swampy/marshy conditions. Sometimes cut off meander are shifted up in due course of time and resulted in swampy/marshy area.

Swampy/marshy area were observed on 463.64 ha. (2.24 % of the total geographical area) in Benipur Baldeo, Gulalpur, Gauripur, Guwawan, Narauli, Anapur, Bishundas Pur, Pure Faji, Paiga, Barna Tikar, Jehumaui, Lugri, Medan Mawi, Banwari Pur, Tikariya, Babupur, Anni Baijal, Argwan, Darpipur, Baburi Tola, Samhanwa, Pandri, Aintha, Saintha villages.

**Table-2 Spatial distribution of wetlands in Gauriganj block (based on satellite data, 2010).**

| Sl.No. | Wetlands | Number of villages | Village name |
|---|---|---|---|
| 1 | Lake/ponds | 16 | Manjhwara, Narauli, Rohshi Khurd, Bishundas Pur, Raj Garh,Misrauli, Asaida Pur, Dhani Jalapur, Barna Tikar, Pachehri, Argwan, Babupur, Sakrawan, Raj Patti, Saintha, Paharganj. |
| 2 | Swampy /Marshy area | 24 | Benipur Baldeo , Gulalpur, Gauripur, Guwawan, Narauli, Anapur, Bishundas Pur, Pure Faji, Paiga, Barna Tikar, Jehumaui, Lugri, Medan Mawi, Banwari Pur, Tikariya, Babupur, Anni Baijal, Argwan, Darpipur, Baburi Tola, Samhanwa, Pandri, Aintha, Saintha. |
| 3 | Water logged area (permanent) | 10 | Gulalpur, Benipur Baldev, Tulsi Pur, Sujapur,Gauri Pur, Jagdishpur, Ana Pur,Barna Tikar, Raj Garh, Misrauli. |
| 4 | Water logged area (seasonal) | 62 | Benipur Baldeo,Guwawan, Bishundas Pur, Pandri, Madho Pur , Lugri, Tikariya, Saripur, Sembhue, Sujanpur, Darpipur, Pahar Ganj , Barna Tikar , Oripur, Argwan, Kaji Patti , Saintha, Chhitepur, Bhawan Shah Pur, Anni Baijal , Babupur, Pure Fajil , Bastidai, Sakrawan, Kharanwan, Rohshi Khurd, Ronhsi Buzurg, Sarai Barwand Singh , Katra Lal Ganj , Sogara, Gopalipur, Misrauli, Biswan, Paiga, Bhatgawan, Dhani Jalalpur, Garha Mafi, Banwari Pur, Asaida Pur, Rauja, Sarai Hirday Shah , Lila Tikara , Pachehri, Amiya, Baburi Tola , Raj Garh , Samhanwa, Jagmalpur, Gulalpur, Narauli, Sarauli, Belkhaur, Shahbaj Pur , Ramai Pur,Raghipur, Jagdishpur, Manjhwara, Mahima Pur, Tulsi Pur, Khajuri, Rampur Kurwa |
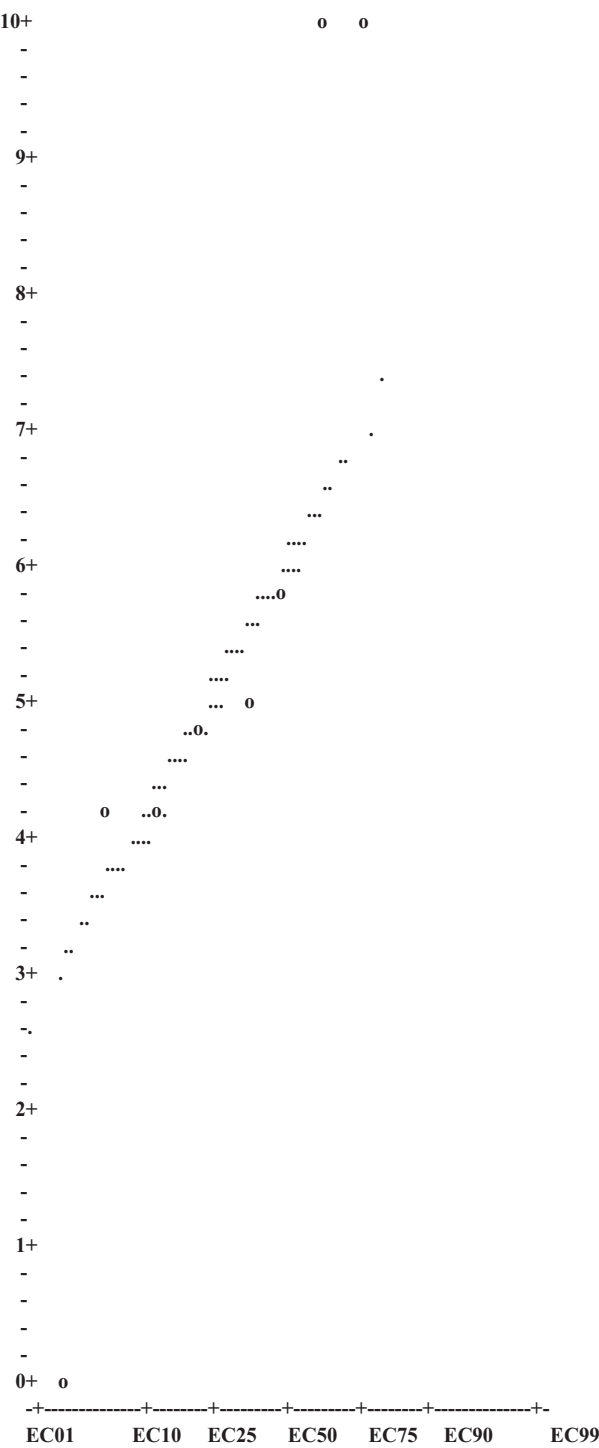
**Fig. 1 b. Curve for 96 h acute toxicity in December showing adjusted probits and predicted regression line**

Behavioral alterations observed in the exposed fishes are summarized in the table 3. They are similar in both seasons but intensity is higher in August than in December. Exposure to dimethoate causes excitement, disruption of schooling, surfacing and gulping of surface water, coughing resulting in accumulation of bubbles, and weakening of reflexes, abnormal swimming, loss of posture and balance, reduced opercular rate but enhanced mucus secretion. Increased defecation and change in skin color are conspicuous in August but not in December.

Behavioral abnormalities appear as manifestation of dimethoate toxicity. Excited, erratic abnormal swimming as observed in the present study may be caused by accumulation of acetylcholine in neuromuscular junctions (Rao *et al.* 2005). Kumar and Chapman (1998) have also reported increased swimming activity in eastern rainbow fish (*Melanotaenia duboulayi*) after exposure to profenofos. Increased surfacing and gulping of surface water by exposed fishes may be an attempt to avoid breathing in contaminated water. Similar observations have been made in *Anabas testudineus* exposed to monocrotophos by Santhakumar and Balaji (2000). Reduced opercular rate may help in reducing absorption and coughing may help in physical removal of toxicant from surface of branchial epithelium. Ganeshwade et al. (2006) have also reported reduced opercular rate and increased coughing in common carp exposed to industrial effluents. Frequent coughing and enhanced mucus secretion observed in December may be due to high exposure concentration than in August.

in different organism for the same toxicant. In *Clarias batrachus* 96 h LC$_{50}$ for dimethoate has been reported as 65mg/l (Begum and Vijayaraghavan, 1995), while in *Saccobranchus fossilis* it is reported as 4.57 mg/l (Verma *et al*., 1982). Even in the same organism different LC$_{50}$ values for the same toxicant are common because acute toxicity may vary according to physicochemical parameters of test water as well as biological conditions of the test organism (Sprague, 1969). De Mel and Pathiratne (2005) have reported very high 96 h LC$_{50}$ value (26.11 mg/l) of dimethoate for the fry (size 20 – 34 mm) of *Cyprinus carpio*. While in the present study 96 h LC$_{50}$ of dimethoate for *Cyprinus carpio* is found only as 1.60 mg/l in August and 3.85 mg/l in December.

Physicochemical factors like temperature, pH and hardness have been found to influence toxicity of different toxicants to fish. Variation in temperature may increase or decrease toxicity of the chemical depending on the species and chemical nature of toxicant. At higher temperatures increased sensitivity to dimethoate toxicity in the present study is in agreement with Patra *et al.* (2007) who reported increased mortality in different fishes exposed to endosulfan and chlorpyrifos at higher temperatures. Reduced survival with rise in temperature and pH both in cypermethrin exposed *Oreochromis mossambicus* have been reported by Parithabhanu and Deepak (2014). Kumar and Gupta (2006) reported increase in mortality of mercury exposed fingerlings of

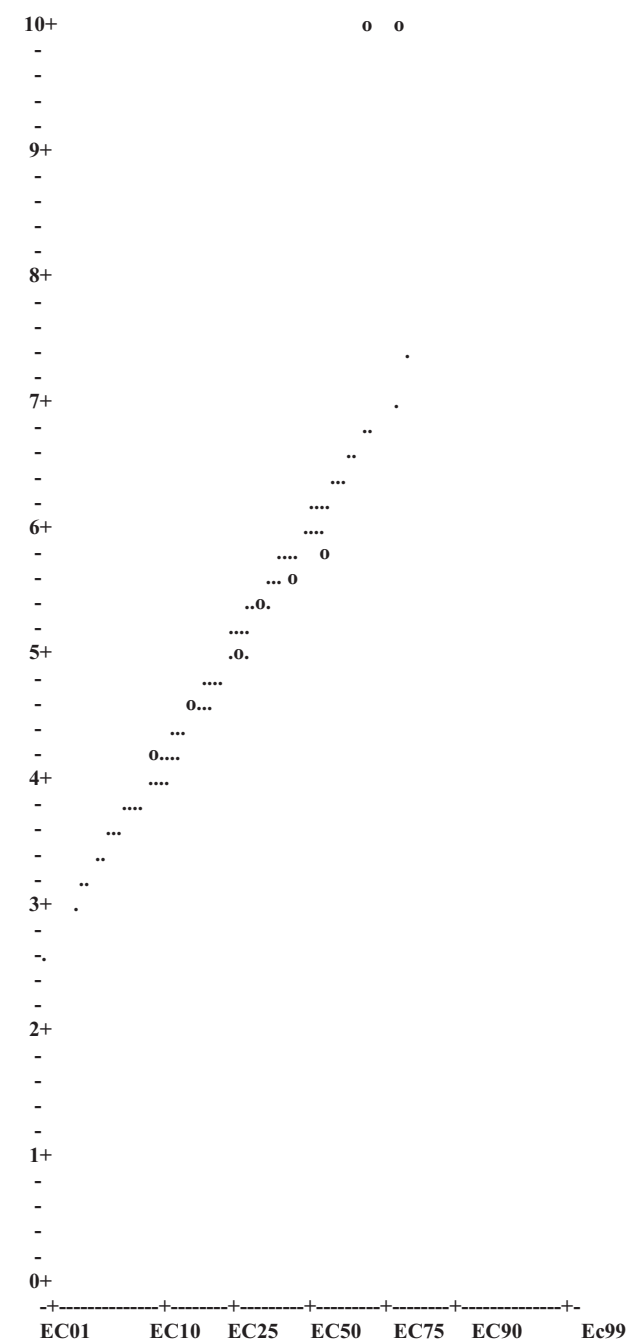Indian Major Carps with rise in water temperature which decreased with increase in water hardness.

Probits



**Fig 1 a. Curve for 96 h acute toxicity in August showing adjusted probits and predicted regression line**

The lake/ponds covered about 1.17% (244.17) of the total geographical area. They were found in Manjhwara, Narauli, Rohshi Khurd, Bishundas Pur, Raj Garh,Misrauli, Asaida Pur, Dhani Jalapur, Barna Tikar, Pachehri, Argwan, Babupur, Sakrawan, Raj Patti, Saintha, and Paharganj villages. Pond/lakes are important not only for irrigation and drinking water facilities but also for ground water recharge system and development of fisheries. But unfortunately it has been frequently overlooked in development activities of block. Pond is small water body as compare to lake including oxbow lake indicate a quite standing water bodies in bed of river system. There are relict impressions of palaeo depression left by rivers. These palaeo depressions have been silted up and stringed to present day dimensions. Some of the Lake/Pond has been rejuvenated due to canal seepage. Most of the lake/pond occurs on old alluvial plain.

In the present study, delineation and mapping of wetlands was carried out using visual image processing techniques. The study reveals that remotely sensed data in conjunction with field surveys and the knowledge- based criteria followed in GIS is very useful in mapping and inventory of wetlands. The spatial study of wetlands could serve as guiding tool, in conservation / prioritization of wetlands.

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**Table1. Physicochemical properties of test water**

| Month | Water Temp.($^0$C) | pH | DO (mg/l) | Free $CO_2$(mg/l) | Hardness(mg/l) |
|---|---|---|---|---|---|
| August | 28±2.00 | 7.4±0.52 | 7.2±0.50 | 4.16±0.36 | 115.24±1.13 |
| December | 18±0.64 | 7.3±0.44 | 7.6±0.14 | 4.32±.32 | 114.66±3.22 |

No mortality and 100% mortality of *Cyprinus carpio* fingerlings in the month of August were recorded as 1.30 mg/l and 2.10 mg /l while for December they were respectively recorded as 3.20 and 4.60 mg/l. In the present study, $LC_{50}$ values and respective 95% lower and upper confidence limits of dimethoate for 24, 48, 72 and 96 h are found lower in August than in December (Table 2), reflecting more vulnerability of common carp fingerlings to dimethoate stress at higher temperatures. $LC_{50}$ values for 96 h vary widely at the two temperatures as given in the table 2 which is also reflected in the curves of adjusted probits and predicted regression line for 96 h dimethoate toxicity to common carp in the two months (Fig1a, b).

Table 2. $LC_{50}$ values, 95% confidence limits, Slope, Intercept, and Chi square values for heterogeneity in common carp exposed to dimethoate in August (28±2.00$^0$C) and December (18±0.64$^0$C)

$LC_{50}$ values have been found to be very different

| | Duration (h) | $LC_{50}$ mg/l | 95% confidence limits | | Slope | Intercept | Chi square for Heterogeneity |
|---|---|---|---|---|---|---|---|
| | | | Lower | Upper | | | |
| A U G U S T | 24 | 1.84 | 1.78 | 1.91 | 18.31 | 0.14 | 5.72 |
| | 48 | 1.78 | 1.72 | 1.84 | 18.84 | 0.25 | 4.42 |
| | 72 | 1.68 | 1.62 | 1.73 | 19.13 | 0.69 | 4.39 |
| | 96 | 1.60 | 1.53 | 1.66 | 16.78 | 1.56 | 2.76 |
| D E C E M B E R | 24 | 4.25 | 4.13 | 4.39 | 35.20 | -17.12 | 3.30 |
| | 48 | 4.13 | 3.99 | 4.30 | 23.75 | - 9.60 | 5.35 |
| | 72 | 3.98 | 3.85 | 4.12 | 25.39 | - 10.24 | 4.94 |
| | 96 | 3.85 | 3.72 | 3.98 | 25.41 | - 9.89 | 4.31 |

response is established by exposing groups of organisms to various concentrations of the chemical. LC5o values are favored over other measures of acute toxicity as they have greatest level of confidence i. e., the smallest 95% confidence interval (Leblanc, 2004).

Acute toxicity of a chemical may vary in poikilothermic animals in different seasons as variations in ambient temperature can affect metabolism of xenobiotics in such animals. Depending on chemical, two types of effects of temperature on toxicity are reported; for some toxicity increases at both high and low temperature and for others it increases only with increase in temperature.

Common carp, an exotic major carp is very popular food fish preferred by culturists due to its hardy nature and fast growth rate. Present study therefore, investigates the effect of temperature on acute toxicity of dimethoate in common carp by conducting experiments under natural photoperiods in two months, one hot (in the month of August) and other cool (in the month of December).

## MATERIALS AND METHODS

Fingerlings of common carp, *Cyprinus carpio* (size 5±1.5 cm, weight 9±1.5 g) were collected from local ponds and were carefully brought to the laboratory in polythene water bags. They were immediately given two minute bath in potassium permanganate (0.05%) before releasing into plastic pools for acclimatization to laboratory conditions. During two weeks of acclimatization they were given ad libitum rice bran mixed with mustard oilcake (3:1) as feed, and pool water was changed daily.

Static bioassay was conducted under natural photoperiod and temperature in the month of August (28± 2$^0$C) and December (18± 0.64$^0$C). Water quality parameters viz. water temperature; pH, dissolved oxygen, free carbon di oxide and hardness as calcium carbonate were measured as per APHA (table 1). Glass troughs of 10 liter capacity were used in the experiment. Technical grade dimethoate (ROGOR, EC 30%) was procured from Rallis India and stock solution was prepared in absolute alcohol. Range finding tests were conducted in both August and December months for deciding final exposure concentration to calculate LC$_{50}$. In the range finding and final exposures both, the poison was mixed in the trough water with the help of glass rod before releasing fingerlings.

Feeding was stopped 24 h before the experiment and no food was given during the test (Reish and Oshida, 1987). Final exposure concentrations were repeated four times along with a control in the two seasons. Mortalities were recorded at 24, 48, 72 and 96 h exposure, and dead fishes were removed as soon as spotted. Mortality data obtained was analyzed by USEPA software of probit analysis version 1.5 based on Finney (1971) to determine LC$_{50}$ values and 95% lower and upper confidence limits. Behavioral responses of fishes were recorded at 6, 24, 48, 72 and 96 h of exposure.

## RESULTS AND DISCUSSION

# EFFECT OF FOLIAR FEEDING OF UREA AND GIBBERELLIC ACID ON FLORIFEROUSNESS AND YIELD OF CULCUTTIA ROSE UNDER ALLAHABAD CONDITION

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## ABSTRACT

GA$_3$ 50 ppm increased the plant height, number of branches per plant and number of flower bud per plant of the Culcuttia rose significantly. Similarly number of flower per plant, weight of single flower, diameter of flower and yield of flower per plant were also maximum with GA$_3$ 50 ppm spray. All the treatments were better over control. Urea spray @ 2000 ppm was also given better result but was little inferior to that of GA$_3$ 50 ppm treatment. Higher concentration (GA$_3$ 100 ppm and urea 3000 ppm) have given repressing results where as lower concentration of the chemicals were proved ineffective up to that level. Conclusively, it may advocated that twice application of GA$_3$ i.e. first at 25 days after pruning and second after 15 days of first spray improves yield and quality of Culcuttia rose in Allahabad conditions.

*Key Words:* Rose, GA$_3$, urea, flower, spray.

Culcuttia Rose (Rose sp.) is very hardy bush and easily propagated through cuttings. It is very floriferous and blooms round the year. It is sweet fragmanted specially suited to loose flower. Flowers are solitary and central portion is open as petals outcurved in full bloom. It ranks first in garland making in India. Perfame is also extracted from it.

## MATERIALS AND METHODS

Trail was carried out with different levels of chemicals in the Department of Horticulture, Kulbhaskar Ashram P.G. College, Allahabad during year 2011-12. Three levels of GA$_3$ i.e. 25 ppm, 50 ppm and 100 ppm and urea i.e. 1000 ppm, 2000 ppm and 3000 ppm were sprayed. Two spray of each concentration were done keeping 15 days interval between two spray. 1$^{st}$ spray was done at 25 days after pruning. There were 7 treatment combinations including control. In control plot all cultural practices were done as per recommendations expect chemical spray. Both the chemicals were dissolved in distilled water and spraying was done immediately. Plant height was measured in centimeter at bloom stage. Number of branches per plant were also counted at flowering stage. Number of flower bud were counted up to last flush of flowering. Number of flower per bush were recorded at half bloom stage. Weight of flower was taken in average manner. Size of flower was recorded by measuring diameter of flower at full bloom stage in centimeter. Yield of flower per bush was

recorded by weighing all the fresh bloomed flower. Analysis of data was done statistically and result were drawn.

## RESULTS AND DISCUSSION

Treatments were found to have conspicuous influence on vigour, floriferousness and yield of culcuttia rose under Allahabad condition. Gibberellic acid was a little better over urea foliar application. Gibberellic acid 50 ppm concentration was proved best in terms of plant height (98.35 cm), number of branches per plant (15.11) and number of flower bud per plant (103.01). Second best result was observed in urea 2000 ppm and data were 92.21 cm, 14.1 and 101.10 respectively for the parameters. Lowest value were observed in control i.e. 60.98 cm, 9.21 and 31.03 respectively. Higher concentration of $GA_3$ and urea gave suppressing result and was

approximately at par with the control. It is clear from the table that $GA_3$ envigorateed the Culcuttia rose significantly at 50 ppm concentration. $GA_3$ has very high potentiality of cell elongation. It also balance the hormonal level of the plant which ultimately generates high number of buds per plant. Taller can has capacity to generate high number of side branches. Similarly, Urea contains nitrogen which improves growth by synthesizing in large quantity of protein. The finding of the study supported and corroborated the finding of Saad etal (2007), Narayan etal (2006) and Bihari etal (2010).

Data regarding floriferousness and flower were also encouraging. Number of flower per bush, average weight of single flower, diameter of flower and yield of flower per bush was highest (100.21, 13.07 g, 6.13 cm, 1300.11 g, respectively) in $GA_3$ 50 ppm

**Table - 1 : Effect of $GA_3$ and Urea on vigour of the plant**

| Treatment | Combination | Plant height (cm) | No. of branches per plant | No. of flower bud per plant |
|---|---|---|---|---|
| $T_1$ | Control (no spray) | 60.98 | 9.21 | 31.03 |
| $T_2$ | $GA_3$ 25 ppm | 70.03 | 10.03 | 61.12 |
| $T_3$ | $GA_3$ 50 ppm | 98.35 | 15.11 | 103.01 |
| $T_4$ | $GA_3$ 100 ppm | 50.31 | 9.97 | 37.93 |
| $T_5$ | Urea 1000 ppm | 73.03 | 12.03 | 68.44 |
| $T_6$ | Urea 2000 ppm | 92.21 | 14.11 | 100.10 |
| $T_7$ | Urea 3000 ppm | 40.10 | 9.95 | 32.22 |
| CD at 5% | | 5.01 | 2.39 | 4.84 |

# EFFECT OF TEMPERATURE ON ACUTE TOXICITY OF DIMETHOATE TO COMMON CARP, *CYPRINUS CARPIO* (LINN.)

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## ABSTRACT

Study was carried out in the months of August and December to assess the effect of temperature on acute toxicity of dimethoate in common carp, *Cyprinus carpio*. Fingerlings of common carp were exposed to dimethoate for 96 h and mortality was recorded at 24, 48, 72 and 96 hour. Mortality data was analyzed by US EPA software of probit analysis (version 1.5) to determine $LC_{50}$ values for different durations. $LC_{50}$ values for 24, 48, 72 and 96 h for August were calculated as 1.84, 1.78, 1.68, 1.60mg/l and for December as 4.25, 4.93, 3.90, 3.85 mg/l, respectively. Behavioral alterations like reduced opercular rate, erratic swimming, and increased mucus secretion, coughing, weakening of reflexes and fading of skin were also observed in dimethoate exposed fishes. This study demonstrates that dimethoate causes serious alterations in behavior and physiology of fishes and becomes more toxic to common carp at higher water temperatures.

Dimethoate an organophosphate insecticide was first developed in 1956 to control insects such as houseflies. Today it is extensively used in agriculture for controlling insects on fruits, vegetables, cotton, tobacco, sunflower, olives and ornamentals. It works as nerve poison by irreversibly blocking acetyl cholinesterase in synapses. It's very high toxicity for insects is accounted by less activity of degradative enzymes in insects than in mammals. Like other synthetic pesticides dimethoate is also toxic to non target organisms. It reaches water bodies through runoff water from agricultural fields and adversely affects fauna including fish. Several workers have reported acute and chronic toxicity of dimethoate in fish (Begum and Vijayaraghavan, 1995; Kumar and Singh, 2000; Pandey *et. al.*, 2009; Singh, 2013).

Acute toxicity refers to toxicity elicited immediately following short term (usually single) exposure to a chemical. Acute toxicity of a chemical can be quantified by its dose – response curve. The relationship between dose of a chemical administered and the resulting

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treatment. Next best result was found with Urea 2000 ppm i.e. 97.73, 12.99 g, 5.92 cm, 1164.11 g respectively for the parameters. Control was yielded minimum values i.e. 29.07, 10.23 g, 4.93 cm, 290.23 g respectively. Higher concentration of $GA_3$ 100 ppm and Urea 3000 ppm gave retarding effects for the parameter. Lower concentration of $GA_3$ 25 ppm and Urea 1000 ppm could not influence the floriferousness up to the mark. Higher number of branches and bud ultimately generated more number of flower per bush. Weight and size of flower was also maximum as $GA_3$ and Urea influenced the vigour of the petals. Higher availability of nutrients, balance metabolic process and greater cell elongation might have resulted better vigour and yield of flower. Similar results were also recorded by Bihari etal (2009) and Yadav etal (2005)

**Table - 2 : Effect of $GA_3$ and Urea on floriforousness and yield of flower**

| Treatment | No. of flower per plant | Weight of single flower (g) | Diameter of flower (cm) | Yield of flower per plant (g) |
|---|---|---|---|---|
| $T_1$ | 29.07 | 10.23 | 4.93 | 290.23 |
| $T_2$ | 59.21 | 12.12 | 5.91 | 708.52 |
| $T_3$ | 100.21 | 13.07 | 6.13 | 1300.11 |
| $T_4$ | 35.01 | 10.09 | 4.91 | 350.17 |
| $T_5$ | 65.50 | 12.91 | 5.23 | 786.21 |
| $T_6$ | 97.73 | 12.99 | 5.92 | 1164.11 |
| $T_7$ | 30.09 | 9.93 | 4.87 | 270.17 |
| CD at 5% | 2.34 | 0.371 | 0.410 | 5.37 |

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# ENVIRONMENTAL NEWS COVERAGE IN INDIAN DAILIES: A COMPARATIVE CONTENT ANALYSIS

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## ABSTRACT

**A study was conducted about the coverage of environmental news in leading daily newspapers namely Dainik Jagran, Rashtriya Sahara, Hindustan Times and Times of India. Daily environmental news have collected from the newspapers and tabulated on the basis of geographical relevance, daywise distribution, proportion of news in upper half and lower half and space for envirionmental news in centimeter. It was observed that there was improper distribution of regional, state, national and international news. Page wise distribution was also not appropriate. News related to the agriculture, space technology and medical health should be given more emphasis.**

***Key words:*** Content Analysis, Environment awareness, print media

Modern lifestyles of developed man causes serious challenges to the environment . Present society is well aware of the drastic results generated due to ignorance of environmental safety parameters. If we continuously pollute air, water, soil and food, it will be major threat to our livelihood. Unchecked use of pesticides in crops, uncontrolled lifting of ground water, radiation generated through radiation labs, sound pollution ,noise pollution are some examples of our modern life. Media is very strong medium to highlight the major issues and aware the people about the environmental issues.

Print media is very old in our country as 38 papers have celebrated centenaries. It has been rightly pointed out and emphasized that there is urgent need to create awareness among the masses about our environment. The print media plays a very important role as a means of communication to create awareness among people. Therefore, the present study entitled "Environmental News Coverage in Indian Dailies: A Comparative Content Analysis" was planned with the following specific objectives.

☐ To examine the contents of environmental issues being brought out by the selected regional and national dailies.

☐ To make inter and intra comparison of content of environmental issues being brought out by the selected regional and national

dailies.

## MATERIALS AND METHODS

The present study is concerned with newspapers as clearly stated in the objectives. The highest numbers of news papers are published in Hindi followed by English in India. Therefore, newspapers of these two languages were taken into the account for the purpose of the study. In view of the importance of issues and the objectives of study following systematic research procedure was adopted.

Considering the popularity of newspaper in the eastern U.P. two regional Hindi newspapers namely Dainik Jagran (DJ) and Rashtriya Sahara (RS), and two national English newspapers namely Times of India (TOI) and Hindustan Times (HT) were selected for the study. All the issues of the selected dailies published during December 2007 to May 2008 were considered for the purpose of the study. For the purpose of study environmental issues were categorized into ten sub areas. These are nature, disasters, natural calamities, natural resources, pollution, sanitation, forest, wildlife, conservation and industrial exploitation by man. The dimensions and parameters used for the analysis of content of newspapers are as under:

| Dimensions | Parameters |
|---|---|
| Format | Distribution of page |
| Coverage of environmental issues | column in centimeters |
| Presentation of contents and pictorial status | Relatedness specially developed |
| Placement of environmental issues | Distribution of page and column |

The collected data was tabulated and analysed in the light of objectives frequency and percentage.

## RESULTS AND DISCUSSION

### 1. Geographical Relevance of

### Environmental News in Selected Dailies:

Geographical interests play vary important role in selection and coverage of news in district, state, national and international news papers. Geographical coverage of news in regional and national dailies are given in table 1

Findings of the table 1 reflect that state level news occupied maximum percentage (33.0) followed by international (23.8), national (22.4) and district level (20.8) ,respectively. Regional dailies publish more district news (28.5 percent) than national dailies (12.3 per cent).National dailies focused

The exposure of fish to different concentrations of the effluent shows different behavioural responses. At lower range of concentration (10 - 40 V%) the fish were a bit disturbed and alert, swimming rapidly for a while and then remained static in response to the changed environmental condition. This behavior was not observed in control set where fish were calm and showed normal swimming behavior. However, changes in behavioural parameters were more evident at higher concentration ranges (50 V% onward). The opercular movement (Fig 2.) was increased and also the frequency of surfacing and gulping of air by the fish have increased. Other apparent changes in fish behavior observed were uncoordinated, erratic and jerky swimming, somersaulting, hyper-excitability and convulsions.

The static bioassay procedures to study the toxicity of pulp and paper mill effluent to a number of fishes have been reported (Hewitt et al 2006). The toxicity, in terms of $LC_{50}$ values, varies for species to species depending on bioassay conditions and species. Nanda et al. (2002) have reported that *Anabus testudineus* was most susceptible to paper mill effluent, while *Channa punctatus* and *Clarias batrachus* were comparatively resistant. Burton et al. (2007) have observed increased mortality in striped bass (*Morone saxatilis*) after 72 hours of exposure of Bleached kraft mill effluent concentrations. Pathan et al. (2009) have reported $LC_{50}$ values of paper mill effluent as 11, 10.5, 10.1 and 9.5% respectively for 24, 48, 72 and 96 h in *Rasbora daniconius*. Toxicity (96 h

$LC_{50}$) of paper mill effluent to fish *Puntius sophor* was estimated to be 1.5% under non-aerated condition while under aerated condition it was recorded at 16.5% (Kumar et al., 1991). In fingerlings of *Oreochromis mossambicus* the 96-h LC50 value of paper and pulp mill effluent to was reported to be 6% (Varadaraj andSubramanian, 1991). Pathan et al. (2009) have reported the toxicity and behavioral changes in *Rasbora daniconius* exposed to lethal concentration of paper mill effluent. At different concentrations, erratic swimming, jerky movement, rapid opercular movement, leaping out of water and thick mucous covering over the whole body surface was documented. Similar results were observed by Srivastava et al. (2007) when *Labeo rohita* and *Channa punctatus* were exposed to paper mill effluents. Mishra et al., (2011) measured the acute toxicity of paper mill effluent on the behavioral responses in *Mystus vittatus.* The opercular movement (OCM) due to the toxin exposure has been reported to increase in fishes *Clarias gariepynus* (Omitoyin et al., 2006) and *Heteropneustes fossilis* (Pandey et al., 2008, 2009). To cope with this deficiency, fish gulps air from outside by frequent surfacing.

The study concludes that the fish *Clarias batrachus* is susceptible to exposure of paper and pulp effluents at varying concentrations. The exposure effect manifests in various form including fish mortality and altered behaviors. The results of the study may be fruitful in understanding of toxic effects of the effluents and taking preemptive remedial measures.

**Table 2. 96h LC$_{50}$ value of Paper mill effluent on *Clarias batrachus at various***
***exposure concentrations***

**Estimated LC/EC Values and Confidence Limits**

| Exposure Point | Conc. | 95% Confidence Limits Lower | Upper |
|---|---|---|---|
| LC/EC 1.00 | 13.511 | 10.426 | 16.369 |
| LC/EC 5.00 | 19.006 | 15.574 | 22.063 |
| LC/EC 10.00 | 22.799 | 19.268 | 25.897 |
| LC/EC 15.00 | 25.777 | 22.229 | 28.876 |
| LC/EC 50.00 | 43.316 | 39.992 | 46.534 |
| LC/EC 85.00 | 72.788 | 67.017 | 80.508 |
| LC/EC 90.00 | 82.298 | 74.981 | 92.565 |
| LC/EC 95.00 | 98.719 | 88.287 | 114.168 |
| LC/EC 99.00 | 138.868 | 119.341 | 170.054 |

**Fig 2. Rate of Opercular Movement (per minute) in *Clarias batrachus* exposed to**
**varying concentration of paper and pulp mill effluent**



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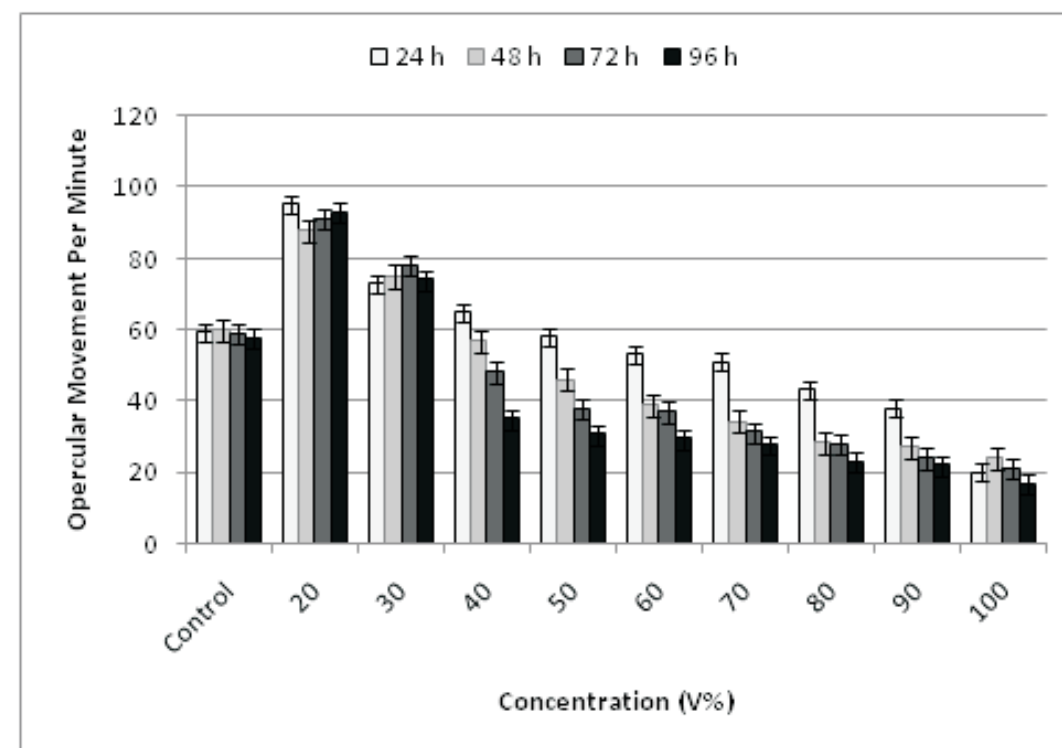
**Table 1: Geographical Relevance of Environmental News in Selected Dailies**

| S.N. | Geographical area related to | Frequency of distribution | | | | | | | | Total | Percentage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Regional dailies | | | | National dailies | | | | | |
| | | DJ | RS | Total | % | TOI | HT | Total | % | | |
| 1 | District | 304 | 220 | 524 | 28.5 | 111 | 91 | 202 | 12.3 | 726 | 20.8 |
| 2 | State | 306 | 324 | 630 | 34.3 | 300 | 216 | 516 | 31.5 | 1146 | 33.0 |
| 3 | National | 133 | 176 | 309 | 16.8 | 230 | 240 | 470 | 28.7 | 779 | 22.4 |
| 4 | International | 109 | 267 | 376 | 20.4 | 146 | 304 | 450 | 27.5 | 826 | 23.8 |
| | Total | 852 | 987 | 1839 | 100 | 787 | 851 | 1638 | 100 | 3477 | 100 |

on national and international news. Singh et. al. (1988) found that national dailies published environmental news but it was generally at the level of country. Chaube (1992) found that national level environmental issues were published highly followed by state, district and international levels.

**2. Day wise frequency distribution of Environmental issues appeared in National and Regional dailies :** Publishers of newspapers select the news, views and advertisements on the basis of time available to the readers concerned. Seven days of the week covers differential proportion of news on environment .The daywise distribution of environmental news are presented in table 2

It is clear from table 2 that regional dailies published 11.5 per centnews on Sunday whereas, it was 12.0 per cnt in case of national dailies .The frequency of publication of environmental news from Monday to Saturday was 14.0 per cent to 15.5 per cent in regional dailies and from 13.0 percent to 17.0 per cent in national dailies.The findings indicate that frequency of publication of environmental news is appropriate in all the days of week except Sunday. Chaube (1992) propounded that the maximum coverage was found during Saturday i.e. 24.45 percent and 22.22 percent in both the regional and national dailies.

**3. Frequency distribution of Environmental news in upper half and lower half in selected**

**Table 2: Day wise frequency distribution of Environmental issues appeared in National and Regional dailies**

| S.No. | Days | Frequency of distribution | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Regional Dailies (RD) | | | | National Dailies (ND) | | | | Total (RD+ND) | Percentagee |
| | | DJ | RS | Total | % | TOI | HT | Total | % | | |
| 1 | Sunday | 107 | 105 | 212 | 11.5 | 98 | 99 | 197 | 12.0 | 409 | 12.0 |
| 2 | Monday | 124 | 137 | 261 | 14 | 102 | 108 | 210 | 13.0 | 471 | 13.4 |
| 3 | Tuesday | 127 | 137 | 264 | 14.5 | 145 | 143 | 288 | 17.0 | 552 | 16.0 |
| 4 | Wednesday | 114 | 152 | 266 | 14.5 | 141 | 106 | 247 | 15.0 | 513 | 14.8 |
| 5 | Thursday | 129 | 152 | 281 | 15.0 | 134 | 108 | 242.0 | 15.0 | 523.0 | 15.0 |
| 6 | Friday | 130 | 154 | 284 | 15.5 | 132 | 113 | 245 | 15.0 | 529 | 15.2 |
| 7 | Saturday | 121 | 150 | 271 | 15.0 | 99 | 110 | 209 | 13 | 480 | 13.6 |
| | Total | 852 | 987 | 1839 | 100.0 | 851 | 787 | 1638 | 100.0 | 3477 | 100.0 |

**National dailies**

Distribution of news in upper and lower half is a major dimension of fixing importance of news in the news papers. Only national dailies have been studied and the data are presented in table 3

Table 3 reflects that 9.4 per cent news were published in upper half and 20.7 per cent in lower half on page no 1. In Hindustan times whereas, it was 11.33 and 54.57 per cent in times of india.The highest proportion (22.80 per cent) of upper half news was found on page no 9 in Hindustan times .Page no 1 have occupied maximum proportion of lower half news in both of them. Times of India have highest proportion (13.73per cent) of upper half news on page no 3. Singh et al.(1988) observed that all the news papers provided more space to environmental news in upper half of the paper. However, space provided to lower half in regional dailies was more than national dailies. The findings

and experimental group. The $LC_{50}$ values of paper mill effluent for 24, 48, 72 and 96 h are summarized in Table 1&2. 96 h mortality probit graph has been depicted in fig1.

**Table 1: $LC_{50}$ Values**

| Duration (h) | $LC_{50}$ (V%) | Lower confidence Limit | Upper confidence Limit |
|---|---|---|---|
| 24 | 120.49 | 104.83 | 150.81 |
| 48 | 85.65 | 78.78 | 96.46 |
| 72 | 68.48 | 54.44 | 92.35 |
| 96 | 43.32 | 39.99 | 46.53 |

**Fig1. Plot of adjusted probits and predicted regression line for 96 h LC₅₀ Probit**
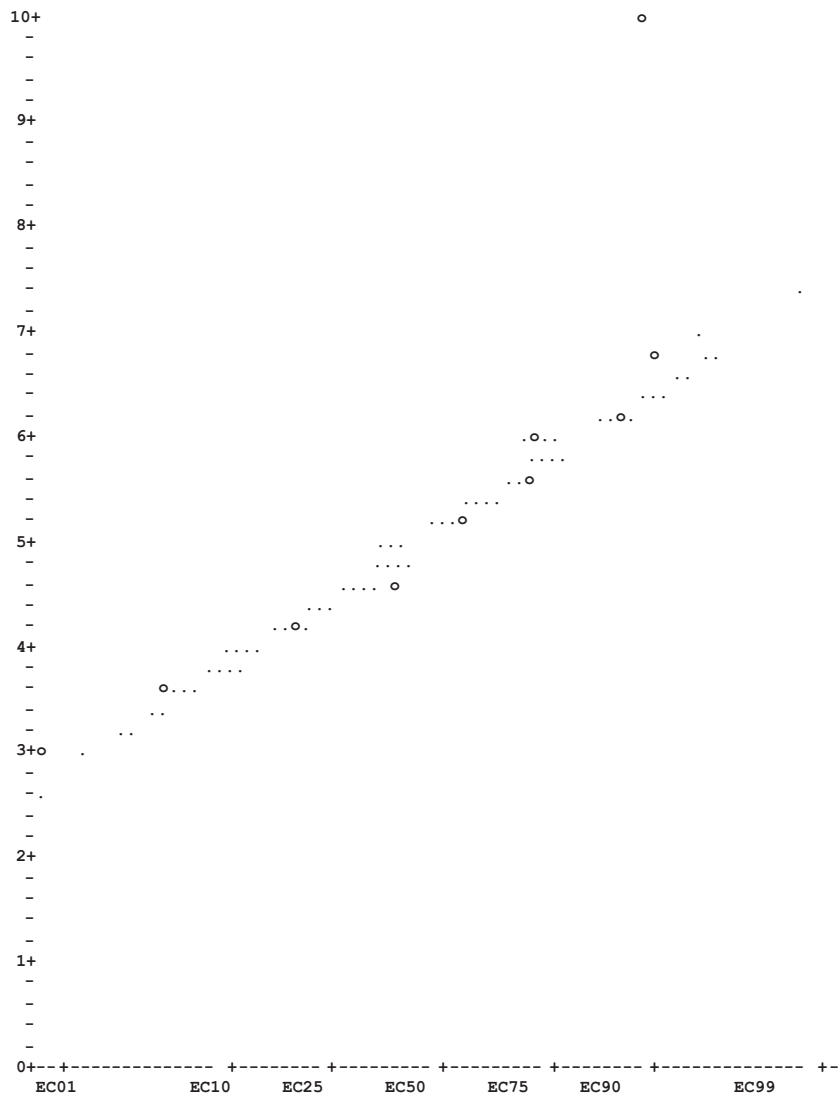
Mishra et al 2011), alterations in biochemical parameters of body, damage in vital organs and disruption in reproductive physiology (Johnsen et al 1998; Wahbi et al 2004; Baer et al., 2009; Joshi and Negi, 2011; Ukagwu et al., 2012; Tyor et al., 2012).

*Clarias batrachus* is a freshwater Indian catfish popularly known as magur. It is distributed all over in Indian subcontinent. They are obligatory air breathers and normally inhabit in low lying water bodies, swamps, marshy and derelict waters, rivers and ponds. They are very hardy in nature (Verma et al., 2011) and can survive in adverse ecological conditions like vey low dissolved oxygen, high turbidity. However, in recent times, the magur population has decreased at an alarming rate due to increasing aquatic pollution and destruction of their habitat (Sahoo et al., 2010; Khedkar et al., 2010). The focus of the present study was therefore, to investigate the effect of paper mill effluent exposure on *Clarias batrachus*.

## MATERIALS AND METHODS

Fish, *Clarias batrachus* of both sexes, were procured from local ponds and safely brought to laboratory and transferred to 500 L capacity plastic tanks containing tap water. The experiment was conducted during the month of October. The physicochemical properties of test water were regularly analyzed for- temperature, DO, free $CO_2$ and total alkalinity as $CaCO_3$ hardness (148.35+ 0.72) and electric conductivity (310 +0.24) during the bioassay.

In the present study static renewal bioassay method (APHA, 2005) was employed

for determination of $LC_{50}$ values for paper mill effluent. The Paper mill effluent was collected directly from the paper mill at releasing site. The percentage concentration of test solution is obtained by using formula (FAO, 1984), which is given bellow :

$$Volume\ \% = \frac{Vef}{Vef + Vdw} \times 100$$

($Vef$ = Vol. of Effluent, $Vdw$ = Vol. of Dilution).

The experiment was conducted for 96 h and the fish mortality at each concentration was recorded at an interval of 24, 48, 72 and 96 h. Different concentrations were prepared by serial dilutions of the effluent on a volume to volume (V%) basis in tap water. Fish were not given any food during the test (Reish and Oshida, 1987). Dead fish were immediately removed from the trough. The LC50 value for the effluent was determined by exposing the fish *C. batrachus* with different concentrations of the effluent (V%) under laboratory conditions for 96 h. The fish mortality data recorded for 24, 48, 72 and 96 h were subjected to analysis using $LC_{50}$ computer software program, version 1.5 developed by EPA based on Finney's (1971) method of Probit analysis to determine $LC_{50}$ values. The opercular movement per minute (OCM) were constantly monitored and recorded for 96 h.

## RESULTS AND DISCUSSION

The physicochemical properties of water during bioassay were - temperature 24.5 ± 1.5 °C, pH 7.2 ± 0.15, dissolved oxygen 8.2 ± 1.6 mg L^{-1} and hardness as $CaCO_3$ 121.65 ± 2.25 mg L^{-1}. No mortality was recorded in control

**Table 3: Frequency distribution of Environmental news in upper half and lower half in selected National dailies**

| Page no. | Frequency of distribution | | | | | | | | Overall | % age |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hindustan Timsh | | | | Times of India | | | | | |
| | UH | % | L.H. | % | UH | % | L.H. | % | | |
| 1 | 51 | 9.4 | 64 | 20.7 | 47 | 11.33 | 203 | 54.57 | 365 | 22.28 |
| 2 | 59 | 10.9 | 41 | 13.2 | 25 | 6.0 | 10 | 2.68 | 135 | 8.24 |
| 3 | 71 | 13.1 | 19 | 6.1 | 57 | 13..73 | 32 | 8.60 | 179 | 10.94 |
| 4 | 37 | 06.8 | 24 | 9.4 | 45 | 10.85 | 21 | 5.65 | 132 | 8.05 |
| 5 | 40 | 07.4 | 12 | 3.9 | 30 | 7.23 | 16 | 4.3 | 98 | 5.98 |
| 6 | 37 | 06.8 | 19 | 6.1 | 19 | 4.58 | 05 | 1.34 | 80 | 4.88 |
| 7 | 14 | 2.6 | 08 | 2.5 | 27 | 6.51 | 09 | 2.42 | 58 | 3.55 |
| 8 | 24 | 4.4 | 25 | 8.1 | 13 | 3.13 | 03 | .81 | 65 | 3.97 |
| 9 | 123 | 22.8 | 62 | 20.00 | 15 | 3.61 | 01 | .26 | 201 | 12.27 |
| 10 | 54 | 10.00 | 16 | 5.2 | 16 | 3.86 | 04 | 1.1 | 90 | 5.49 |
| 11 | 19 | 3.6 | 07 | 2.3 | 07 | 1.69 | 02 | .54 | 35 | 2.14 |
| 12 | 06 | 1.1 | 03 | 1.0 | 27 | 6.52 | 10 | 2.68 | 46 | 2.81 |
| 13 | 05 | 0.9 | 02 | 0.6 | 42 | 10.14 | 21 | 5.65 | 70 | 4.27 |
| 14 | 01 | 0.2 | 01 | 0.3 | 29 | 6.98 | 12 | 3.22 | 43 | 2.63 |
| 15 | | | 02 | 0.6 | 05 | 1.20 | 11 | 2.96 | 18 | 1.10 |
| 16 | | | | | 06 | 1.43 | 05 | 1.34 | 11 | .67 |
| 17 | | | | | 05 | 1.2 | 05 | 1.34 | 10 | .61 |
| 18 | | | | | | | 02 | .54 | 02 | .12 |
| Total | 541 | 100.0 | 310 | 1000 | 415 | 100.0 | 372 | 100.0 | 1638 | 100.0 |

indicate that lower half of page no 1 is mainly selected for printing of environmental news by the leading english newspapers.

**4. Space provided for environmental issues:** News are published in columns and measured in centimeters. The measurement of news are given in table 4.

### Table 4: Space provided for environmental issues(in centimeter)

| S. No. | Months | Times of India | % | Hindustan times | % | DainiK jagran | % | Rashtriya Sahara | % | Total | Percentage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | December | 3709 | 12.84 | 2586 | 7.46 | 5165 | 20.76 | 5953 | 23.04 | 17413 | 15.24 |
| 2 | January | 6468 | 22.39 | 9046 | 26.08 | 5087 | 20.45 | 6211 | 24.04 | 26812 | 23.46 |
| 3 | February | 5119 | 17.72 | 6306 | 18.16 | 5451 | 21.92 | 4281 | 16.57 | 21157 | 18.51 |
| 4 | March | 3266 | 11.30 | 5685 | 16.39 | 2101 | 8.45 | 2368 | 9.11 | 13420 | 11.74 |
| 5 | April | 4740 | 16.40 | 4948 | 14.27 | 3480 | 13.99 | 3656 | 14.16 | 16824 | 14.72 |
| 6 | May | 5592 | 19.35 | 6113 | 17.62 | 3590 | 14.43 | 3364 | 13.02 | 18659 | 16.33 |
|  | Total | 28894 |  | 34684 |  | 24874 |  | 25833 |  | 114285 | 100.00 |

It is clear from table 4 that January month have highest percentage (23.46) of environmental news followed by February (18.51 per cent), may (16.33 per cent), December (15.24 per cent ), april (14.72 per cent ) and march (11.74 per cent) respectively .English newspapers publish more environmental news than hindi newspapers . Chaube et at. (1989) reported that total space provided for environmental issues in column length of four news papers ( two regional and two national dailies ) was 63.93 meters and percentage being 0.22 only during the period of September to November 1989 .

Data shows that Hindi newspapers are lagging behind the English dailies in case of publication of environmental news.

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# EFFECT OF PULP AND PAPER MILL EFFLUENTS ON MORTALITY AND BEHAVIOUR OF FRESH WATER CATFISH *CLARIAS BATRACHUS*

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## ABSTRACT

The pulp and paper mills are one of the most polluting industries which discharge effluents containing a variety of harmful chemicals and solid wastes. The effluents of these mills pollute water bodies affecting aquatic life. Fish are one of the most prominent indicators of pollution. Exposures to hazardous pollutants cause serious physiological and biochemical alterations in the fish. The aim of the present study was to determine the $LC_{50}$ values and alteration in behavioral patterns in freshwater catfish *Clarias batrachus* when exposed to varying concentrations (V%) of the effluent. Probit analysis software version 1.5 was used to analyze fish mortality data and determining the $LC_{50}$ values, which were measured as 85%, 79%, 73% and 69% (V% of effluent) for 24, 48, 72 and 96 h respectively. During study changes in fish behavior due to exposure of the effluent was also carefully monitored. The exposed fishes exhibited significant reduction in opercula movement, increased surface visit, erratic swimming and loss of balance. The results of the study show that the pulp and paper mill effluents are harmful to fish and effluent exposure stress alter the eco-physiology of the fish manifesting as abnormal display of behavior. The study may be used as early warning of effluent pollution and to monitor fish health.

*Key words:* Paper mill effluent, toxicity, behavior, *Clarias batrachus*

Pulp and paper mills utilize high volume of freshwater for the paper processing. In India, around 905.8 million $m^3$ of water is consumed and around 695.7 million $m^3$ of effluent is discharged annually by these industries. The average freshwater consumption (150 $m^3$/ton of product) in India at present is far above the global freshwater consumption (28.67$m^3$/ton) (Malaviya and Rathore 2007). The pulp and paper mill are one of the largest polluting industry and they discharges a variety of gaseous, liquid and solid waste in to the environment (Thompson et al 2001). The industrial effluents carry a load of variety of organic and inorganic toxic substances which are discharged in water bodies affecting aquatic inhabitants (Sumathi and Hung 2006; Cheremisinoff and Rosenfeld 1998). Many of these substances are carcinogenic (Zahrim et al 2007; Leuenberger et al 1985). The paper mill pollutants may cause behavioral changes (Leuenberger et al 1985, Srivastava et al, 2007;

pH are shown in table3 and Fig.2.

**Table2. Adsorption of Cr (VI) by fly ash as a function of Time.**

Initial concentration = 5mg/L

| S. No. | Time (Min.) | Unabsorbed Cr(VI) (mg/L) | Cr(VI) adsorbed (%) |
|--------|-------------|--------------------------|---------------------|
| 1. | 20 | 2.77 | 44.6 |
| 2. | 40 | 2.16 | 56.64 |
| 3. | 60 | 1.78 | 64.32 |
| 4. | 80 | 1.63 | 67.4 |
| 5. | 100 | 1.63 | 67.4 |



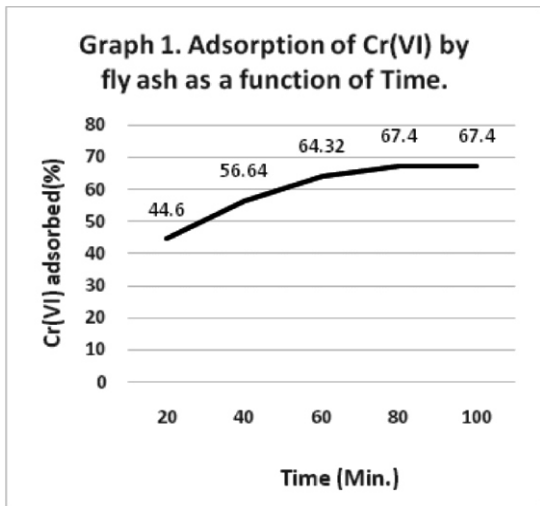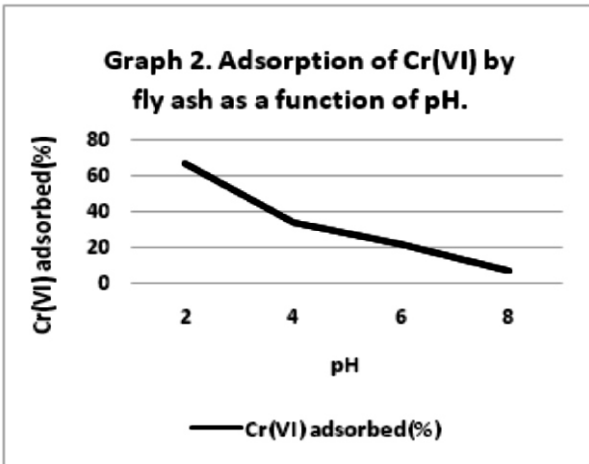Graph 1. Adsorption of Cr(VI) by fly ash as a function of Time.

**Table3. Adsorption of Cr(VI) by fly ash as a function of pH.**

Initial concentration = 5mg/L

| S. No. | pH | Unabsorbed Cr(VI)(mg/L) | Cr(VI) adsorbed(%) |
|--------|-----|-------------------------|---------------------|
| 1. | 2.0 | 1.63 | 67.4 |
| 2. | 4.0 | 3.26 | 34.8 |
| 3. | 6.0 | 3.9 | 22.1 |
| 4. | 8.0 | 4.62 | 7.46 |



Graph 2. Adsorption of Cr(VI) by fly ash as a function of pH.

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khali

# REMOVAL OF Cr(VI) FROM POLLUTED WATER BY ADSORPTION ON FLY ASH

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## ABSTRACT

**An attempt was made to reduce the minas of pollution of water due to Cr(VI) ion. Low cost adsorbent fly ash has been used for this purpose. It was observed that more than 67% of metal ions were removed by substrate solution. The impact of pH and contact time on adsorption behavior was also studied and was found that the metal ion uptake increases with the increase of contact time and decreases with the increase of pH.**

Major ecological changes due to rapid and large scale industrialization have driven scientists and analysts to study on contamination of surface water by heavy metals. During past few decades there has been a considerable and overall increase in the environmental contamination by several heavy metals e.g. mercury, copper, zinc, cobalt, cadmium, nickel, manganese, lead, chromium etc.

Many industrial processes mainly those carried out in tanneries and galvanic industries discharge effluents containing high concentration of chromium, which represents a major environmental and health concern. Chromium occurs in environment predominantly in one of the two valence state: trivalent chromium Cr(III), which occurs naturally and is an essential nutrient as it regulates glucose metabolism in human body and hexavalent chromium Cr (VI) may produce effects on liver, kidney, gastrointestinal and immune system and possibly the blood. Additionally epidemiological studies have clearly established that Cr (VI) should be classified as human carcinogen.

The most common methods of removing chromium are chemical precipitation, electrochemical reduction, sulfide precipitation, ion exchange, reserve osmosis electro dialysis and evaporation etc. These methods are cost intensive and are unaffordable for large scale treatment of waste water. Therefore it is important to identify low cost adsorbent materials for the removal of chromium from waste water. On the other hand, in India every year about 70-80 million tons of fly ash is produced as a waste of f thermal plants. It is posing a great problem of its disposal and environmental pollution. The adsorption of chrome dyes on to fly ash is reported by few investigators. In view this the present study describe the use of fly ash as an adsorbent for the removal of Cr(VI) from waste water.

## MATERIALS AND METHODS

The adsorbent fly ash was obtained from National Thermal Power Corporation, Unchahar, Raebereli, Uttar Pradesh and analyzed for the main constituents e.g. Silica, Aluminum and Iron oxide etc. The different constituents of fly ash have been given in Table 1.

**Table1. The Composition of Fly Ash**

| Fly Ash | Percentage by weight |
|---|---|
| $SiO_2$ | 53.43 |
| $Al_2O_3$ | 27.82 |
| CaO | 3.19 |
| $Fe_2O_3$ | 1.39 |
| MgO | 1.02 |
| Loss in ignition | 13.15 |
| Mean particle size(cm) | $52 \times 10^{-4}$ |
| Density(gm/cm$^3$) | 3.46 |
| Porosity | 0.38 |

A standard stock solution of Cr(VI) was prepared by dissolving a known amount of Potassium Dichromate in distilled water to get a 5mg/L solution.

The adsorption of chromium by fly ash was followed by performing batch type experiments wherein fixed amount of fly ash i.e. 1 gm was taken in glass stoppered bottles. To each of these bottle 50 ml of solution of 5 mg/L was added. These bottled is kept in a shaking bath and mechanically stirred for the desired period depending upon the requirement of the experiment. After a fixed time interval, the resultant mixture was centrifuged to separate the adsorb ate and the adsorbent.10 mL of filtrate was taken out from each bottle and chromium concentration was measured in the filtrate by A.A.S. method using a Perkin-Elmer 3100 A.A.S. with automatic burner control. For investigating effect of pH, it was adjusted by addition of standard solution of NaOH and HCl. The amount of chromium adsorbed under different experimental conditions was evaluated by subtracting the observed value from initial taken amount.

## RESULTS AND DISCUSSION

Table 1 show that the major constituents of fly ash are alumina and silica, while some other oxides are also present in trace amounts. It seems that most of the chromium was absorbed by either alumina or silica or by a combined influence of the major constituents present in adsorbent.

## EFFECT OF CONTACT TIME

The dependence of percentage removal of chromium on contact time is shown in Table 2 and Figure 1. The result show that the adsorption increases with the increase of contact time and almost level off around 80 minutes. The time rate adsorption curve is single, smooth and continuous leading to saturation.

## EFFECT OF pH

The pH of an aqueous solution is an important controlling parameter in the adsorption of chromium on fly ash. So the adsorption was examined in solutions at different pH values 2, 4, 6 and 8. The observations show that the adsorption of chromium decreases sharply between pH 2.0-4.0 and is almost nil at pH 8.0. Hence the maximum amount of chromium(VI) 67.4% was removed at the lower pH values. The dependence of percentage removal of Cr(VI) on