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CONTENTS

TOXICITY OF *EUPHORBIA ROYLEANA* AND *NERIUM INDICUM* LEAF EXTRACT TO FRESHWATER FISH *CHANNA MARULIUS.*

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ABSTRACT

In a study of piscicidal activities of *Euphorbia royleana* (Euphorbiaceae) and *Nerium indicum* (Apocynaceae) against fingerlings of *Channa marulius*, the activity of the leaf was observed to be both time and dose dependent. The toxicity of *N. indicum* leaf extract (LC_{50} = 105.46 mg/L at 24h) was more pronounced than *E. royleana* leaf (LC_{50} = 1069.22 mg/L at 24h) against fingerlings of *C. marulius*. Both the extract was non-toxic against frys of *C. marulius* up to 5 mg/L. These results suggest that users of these extracts in an aquatic medium should take the toxic properties against non-target organism into account to maintain a healthy aquatic environment.

Key words: Euphorbia Royleana, leaf extract, channa narulius.

Medicinal plants have been widely used in India to treat various disorders, including infectious diseases. Indeed, important diseases, such as epizootic ulcerative syndrome, myxobolasis, gyrodactylosis and argulosis have been successfully controlled using turmeric, garlic, onion and other herbal materieals (Goodman, et al., 1985). In recent years, various medicinal plants have been used in aquaculture as molluscicides and piscicides for the removal of unwanted aquatic organism (Yadav and Singh, 2002; Tiwari et al., 2005).

Natural products have gained greater importance, since it is believed that the natural compounds are ecologically sound and culturally more acceptable. Several plants, such as *Euphorbia royleana*, possess bioactive chemical constituents that have high pesticidal activity, making this plant material useful for controlling predatory fish, disease causing insects and freshwater snails in the water bodies (Okunji and Iwu, 1988; Gopalsamy et al., 1990; Singh et al., 1996; Singh and Singh, 2003). Yet, the ectotoxic properties of these plant materials on non-target animals sharing the habitat with target animals have not been investigated.

We are interested in eco-toxic properties of plant origin pesticides. This study examined the toxicity of *Euphorbia royleana* and *Nerium indicum* leaf extract against fingerlings of freshwater fish *Channa marulius*, a plant used in fish catching practices (Prakash and Singh, 2000). *C. marulius*, is an commercially important and a good experimental material due to its size, availability and good survivability in laboratory.

MATERIALS AND METHODS

Preparation of extract: The leaf extracts of both the plants i.e. *Euphorbia royleana* and *Nerium indicum*, gathered from plants growing locally in their natural habitats, were used in this study. The collected leaves were dried overnight at 38°C and then pulverized in a mortar and pestle for use in these experiments. Dried powder of each plant sample was mixed with appropriate volumes of distilled water to obtain desired concentration.

The Test animal: Fingerlings of fish *Channa marulius* (4.2 – 6.7 cm long) were collected from Ramgarh Lake of Gorakhpur district. The aquarium water was aerated continuously and food (Tokyo, A commercial food) was provided in small dried pellet form. The collected fish were subsequently maintaine

in dechlorinated water for acclimatization to laboratory conditions in glass aquaria containing 50 L de-chlorinated tap water. Prior to experiment fishes were allowed to acclimatise to laboratory conditions for seven days. Water was changed every 24h. Averages sized of animals were used for the experiment.

Treatment protocol: Toxicity experiments were performed by the method of Singh and Agarwal (1988). Batches of 10 fish were exposed to four different concentrations of *E. royleana* and *N. indicum* leaf. Concentrations given are the final concentration (w/v) in 6 L aquarium water for 96h. Each set of experiment was replicated six times. Separate aquaria, matched with each treatment, but containing no extract, were kept in similar conditions as controls. Mortality was recorded at 24h, 48h, 72h and 96h with the fish considered dead if they failed to respond to prodding with glass rod. Dead fish were removed from the test container to prevent water fouling. Regression coefficient showed that there was significant ($P<0.05$) negative correlation between exposure period and different LC values. LC values, upper / lower confidence limits and slope value, 'g' values and heterogeneity factor were calculated according to the methods of Russel, *et al.*, (1977).

RESULTS AND DISCUSSION

Physico-chemical properties of the experimental system: Water containing the fish, changed every 24h, had a pH 7.3 to 7.5, dissolved oxygen of 6.9 to 7.7 ml/liter, free carbon dioxide of 4.5 to 6.5 il/liter and bicarbonate alkalinity of 105.0 to 109.0 mg/liter as measured according to methods of APHA/AWWA/WPCF, 1998. Atmospheric and water temperature ranged from 29.5 to 30.5 °C and from 28.0 to 29.0 °C, respectively.

Investigations on the toxicity of *E. royleana* and *N. indicum* leaf extracts against the fingerlings of freshwater paddy fish *C. marulius* is given in Table 1-2. The LC_{50} values of *E. royleana* leaf extract against fingerlings for 24h, 48h, 72h and 96h were 1069.22, 766.74, 592.47 and 450.48 mg/L, respectively, while those for the *N. indicum* leaf extract during the same exposure periods was 105.46, 78.05, 56.38 and 27.08 mg/L.

In case of the leaf extracts, the LC_{50} values were both time and dose dependent. A decrease in the dose necessary to produce the response occurred with an increase in exposure time. Thus, the LC_{50} for leaf of *E. royleana* and *N. indicum* decreased from 1069.22 to 450.48 mg/L and 105.46 to 27.08, respectively, when the exposure period was increased from 24h to 96h.

A value of 't' ratio greater than 1.96 (indicating a significant regression) and the heterogeneity values of less than 1.0 denoting that in the replicate tests of random samples, the concentration response lines would fall within 95 percent confidence limits and thus model t-data adequately. The index of significance of potency examination of 'g' indicates the value of the mean was within limits at all probability levels.

Toxicity experiments demonstrated that leaf extracts of both the plants were lethal to fingerlings of fish *C. marulius*. The leaf extracts of *E. royleana* was more toxic than the *N. indicum*. The lethality of a given concentration of the latex and stem-bark extracts to fish increased with exposure time (Table 1-2). The most obvious sign of distress in the fish treated with leaf or extract was restlessness, labored breathing, loss of equilibrium and lethargy. Other altered behaviour fish exposed to the latex and plant extract were a rapid opercular beat, frequent surfacing, muscular tetany, pectoral fish expansion and jumping from the water. The progressive toxic effects, the fish to sink to bottom of the aquaria and usually lead to death of the animal. Singh and Agarwal (1984a,b,; 1990) have been reported earlier that latex of *E. royleana* and *J. gosspyfolia* cause inhibition of acetylcholine esterase and reduce the endogenous level of other known neuro-transmissitters (5-hydroxytrytamine, epinephrine and dopamine in nervous tissues of the freshwater snail *Lymnaea acuminata* in the time and dose dependent manner).

Similar behavioral responses have been reported in fish exposed to organophosphate and carbamate pesticides (Ahmad, 1975; Ghosh, 1986).

Table 1. Toxicity of leaf extracts of N. indicum at different exposure periods against fingerling of fish C. marulius.

Exposure period	Effective dose [mg/L]	Limits [mg/L] Upper - lower	Slope value	'g' value	't' value	Hetero geneity
24h	LC_{10} = 44.69	28.99–54.40	3.44±0.71	0.168	4.78	0.36
	LC_{50} =105.46	92.78–133.72				
	LC_{90} =248.83	176.75-552.25				
48h	LC_{10} = 28.83	13.25 –39.60	2.97±0.66	0.191	4.48	0.45
	LC_{50} = 78.05	68.05–90.17				
	LC_{90} =111.01	152.4–470.62				
72h	LC_{10} =19.67	5.96-30.56	2.80±0.67	0.221	4.17	0.67
	LC_{50} = 56.38	41.45-65.47				
	LC_{90} =161.58	123.07-328.66				
96h	LC_{10} =8.29	0.18 – 19.42	2.49±0.82	0.412	3.05	0.33
	LC_{50} =27.08	4.71 – 40.55				
	LC_{90} = 88.43	73.29–145.38				

* Mortality was determined every 24h.
Batches of 10 fishes were exposed to four different concentration of above treatment.
* Concentrations given are the final concentration (w/v) in the aquarium water.
* LCL = lower confidence limit, UCL = Upper confidence limit.

Table 2. Toxicity of leaf extracts of E. royleana at different exposure periods against fingerlings of fish C. marulius.

Exposure period	Effective dose [mg/L]	Limits [mg/L] Upper - lower	Slope value	'g' value	't' value	Hetero geneity
24h	LC_{10} = 317.02	140.29–403.08	2.43±0.74	0.36	3.29	0.10
	LC_{50} =1069.22	797.76–3060.88				
	LC_{90} =3606.16	1746.73-6053.56				
48h	LC_{10} =250.12	116.95–327.17	2.64±0.67	0.25	3.94	0.34
	LC_{50} =766.74	641.63 –1174.62				
	LC_{90} =2350.44	1408.44–10457.8				
72h	LC_{10} =180.23	64.67-259.60	2.48±0.62	0.24	3.99	0.33
	LC_{50} =592.47	509.35–756.78				
	LC_{90} =1947.66	1232.67–7179.49				
96h	LC_{10} =126.35	30.00–204.55	2.32±0.60	0.26	3.85	0.16
	LC_{50} =450.48	355.72-530.39				
	LC_{90} =1606.00	1061.28-5465.06				

* Mortality was determined every 24h.
Batches of 10 fishes were exposed to four different concentration of above treatment.
* Concentrations given are the final concentration (w/v) in the aquarium water.
* LCL = lower confidence limit, UCL = Upper confidence limit.

These compounds, which are cholinergic inhibitors, are known nerve poisons (Casida, 1964; Coppage and Mathews, 1975; Rath and Mishra, 1981; Stansely, 1993). Gill *et al.* (1991) described that the behavioral anomalies are due to inhibition of cholinergic impulses by the hydrolysis of neurotransmitter acetylcholine released during synaptic transmission. Similar anticholinergic activity may be responsible for behavioural changes observed with the fish exposed to leaf extract of both the plants.

Increase of mortality with increase in exposure time could be due to several factors acting separately or conjointly. For example, uptake of pesticides is time dependent, leading to a progressive increase of pesticide concentration in the animal body. Stability of pesticide (lifespan) in an environment and the rate of detoxification by the animal can also affect relationship between mortality and exposure period (Mitra et al., 1978; Matsumura, 1985). Kinghorn and Evans (1975) demonstrated that the toxicological action in many plants of euphorbiales is due to presence of a group of diterphene phorbal esters, while in plants of the family euphorbiaceae, the alkaloids, sterols and triterpenoids are responsible for toxicity (Wealth of India., 1985). Singh et al., (2003) have shown, however, that sub-lethal doses extract increase lipid peroxidation and causes reduction in the levels of phospholipids in the nervous tissues of freshwater animals. The latex was more toxic than the stem-bark extract and the lethality of a given concentration of latex and extract to fish increases with exposure time.

Finding of this study indicate that *E. royleana* and *N. indicum* leaf have potent piscicidal activity and can achieve high mortality rates if a similar relationships of lethality to dose occur under field conditions as observed in this study. Thus, plant extracts used directly in water bodies may have unexpected long-term effects on non-target organisms.

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RESPONSE OF BIOFERTILIZERS AND ORGANIC MANURES ON YIELD AND QUALITY OF FENUGREEK

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ABSTRACT

A field study was conducted to investigate the effect of biofertilizers and organic manures on seed yield and quality of fenugreek during the *Rabi* season at Hisar and revealed application of *Rhizobium* + FYM (96.73 cm) treatment significantly increase yield/ha (2077 kg) was recorded with application of recommended dose of NPK (40:50:25 kg/ha), followed by *Rhizobium* + PSB + FYM, *Rhizobium* + FYM, PSB + FYM, *Rhizobium* + Poultry manure and *Rhizobium* + Vermicompost, which were statistically significant over control. Application of different biofertilizers, organic manures and their combinations did not effect the days taken for 50% flowering significantly. Maximum seedling vigour index-I (2051.6) and vigour index-II (7165.4) were obtained when crop was supplied with recommended dose of NPK followed by *Rhizobium* + PSB + vermicompost, *Rhizobium* + FYM and *Rhizobium* + PSB + FYM which were statistically significant over control.

Key words: *fenugreek , biofertilizers , organic manures , growth , yield .*

Fenugreek (*Trigonella foenum-graecum* L.) also known as "methi" is an important seed spice crop grown in northern India during *Rabi* season. It is a multipurpose crop grown for seeds mainly used as spices adds to the nutritive value and flavor of the food. The aroma and flavor of fenugreek has led to its use in many baked goods, chutneys, confections and syrup.It is an important constituent of curry powder.Fenugreek is also used as livestock feed. Leaves and seed contain calcium, phosphorus and few vitamins from B-complex group in addition to vitamin C. It is also rich source of iron. Both leaves and seed are included in normal diet of family. It also has medicinal values against dysentery, diarrhea, chronic cough and spleen and rickets, against digestive disorders, diabetes and have the anti-fertility (Pruthi, 1979, John, 2005). Various research groups observed that use of NPK decline some quality parameters but remarkably give more yield and yield attributes (Detroja *et al.* 1995). Hence, a proper amount of NPK is required to be maintained. Although, legume crop has the capacity to fix atmospheric nitrogen symbiotically and an adequate supply of nitrogen is essential as a starter dose. The mechanism of action of *Rhizobium* as well as phosphate solubilizing bacteria (PSB) micro-organisms involves secretion of organic acid which lower the pH and increase the availability of sparingly soluble phosphorous sources and increase nodulation, growth and nitrogenase activity (Srivastava and Ahlawat, 1995). The quality seed plays a pivotal role and determining quantity as well as quality of production. A good quality seed should be clean/clear, genetically pure, viable, good vigour and free from disease and insect pest. There is a need to have somereliable parameters that evaluate the seed quality. Hence, the availability of genetically pure and vigrous seeds at planting time is important for achieving a targeted agricultural production.

MATERIALS AND METHODS

The Present investigation was carried out at the Research Farm, Department of Vegetable Science

CCS Haryana Agricultural University, Hisar during the *Rabi* season of 2008-09. The soil was sandy loam in nature with nitrogen (68 kg/ha), phosphorus (18 kg/ha), potash (387 kg/ha) and 8.19 PH. Methi seeds contain moisture 13.7 percent, protein 26.2 percent, fat 5.8 percent, minerals 3.0 percent, fiber 7.2 percent and carbohydrates 44.1 percent per 100 grams. The experiment having following 16 treatment combinations with three replications :- T_1- Rhizobium (seed treatment)+ FYM (5.0 t/acre), T_2- Rhizobium(seed treatment) + Poultry manure (1.5 t/acre) , T_3- Rhizobium(seed treatment) + Vermicompost(1.0 t/acre) , T_4- Rhizobium + PSB (seed treatment)+ FYM (5.0 t/acre), T_5- Rhizobium + PSB(seed treatment) + Poultry manure (1.5 t/acre) , T_6- Rhizobium + PSB(seed treatment) + Vermicompost(1.0 t/acre) , T_7- Rhizobium +PSB (seed treatment) , T_8- Rhizobium alone(seed treatment), T_9- PSB(seed treatment) + FYM (5.0 t/acre), T_{10}- PSB(seed treatment) + Poultry manure(1.5 t/acre) , T_{11}- PSB(seed treatment) + Vermicompost(1.0 t/acre) , T_{12}- FYM(5.0 t/acre), T_{13}- NPK (15:20:10 kg/acre), T_{14}- Poultry manure(1.5 t/acre), T_{15}-Vermicompost(1.0 t/acre), T_{16}- Control.

The experimental plot size was 3 x 2.4 m^2 with plant spacing 30 x 10 cm. Well decomposed FYM, poultry manure and vermicompost were applied uniformly as per treatments and incorporated into the soil 3 weeks before sowing of the crop. A basal dose of NPK was given at the time of sowing. The seeds were treated with *Rhizobium* and phosphate solubilizing bacteria (PSB) just before sowing. The methi(sonali HM-57) crop was sown during the second week of November . The crop was raised with recommended package of practices. The observations were recorded on morphological parameters viz. sprouting %, height of branches and pods, pods length and number of seeds/pod and seed yield. The net plot were harvested and allowed to dry the crop for six day in sunlight before threshing. A product of standard germination test value multiplied with seeding length/seedling dry weight/ matter provides a broad evaluation of seedling vigor. The vigour index was calculated as follows:-

Vigour index-I : Standard germination X Seedling length

Vigour index-II : Standard germination X Seedling dry weight

The experiment was conducted in a Randomized Block Design (RBD) and data was statistically analyzed by standard methods (panse and sukhatme, 1985).

RESULTS AND DISCUSSION

1)Effect on seed yield

The data on seed yield per plot is presented in table 1 and in fig.1 showed that the different treatments on yield was effected statistically significantly and indicating that the highest seed yield/ plot (1598 gm) and seed yield per hectare (2077 kg) was obtained by the application of recommended dose of NPK which was statistically at par with *Rhizobium* + PSB + FYM (1535 gm) and *Rhizobium* + FYM (1519 gm). This is might be due to *Rhizobium* inoculation and FYM application could be attributed to better development of roots and increased microbial activities because of balanced nutritional environment probably both in soil rhizosphere and plant system which consequently enhanced value of yield attributes and yield (Kumar *et al.*, 2002). The present findings are in agreement with Bhargva *et al*(1989), Detroja *et al* (1995),Shivran *et al(1995),* Selvarajan and chezhiyan(2000), Khiriya *et al(2003)*, Yadav & Kumawat(2003) and Adak *et al* (2007)

2) Effect on quality parameters:-

The data of quality parameters are presented in Table no.-2 and showed in Fig. no. 2 & 3. The significant differences among different treatments for this character showed that maximum test weight (10.87 g) was recorded where seed was treated with *Rhizobium* and PSB along with application of farmyard manure being at par with application of recommended dose of NPK, seed treatment with *Rhizobium* along with application of farmyard manure and seed treatment with Rhizobium and PSB along with application of vermicompost. Minimum test weight (10.10g) was recorded in control. Maximum seed germination percentage (97.70%) was recorded by

Table-1 Effect of biofertilizers and organic manures on yield parameters of fenugreek

Sr. no.	Treatments	Yield/plot (gm)	Yield/ha (kg)
1.	Rhizobium + FYM	1519	1975
2.	Rhizobium + Poultry manure	1435	1864
3.	Rhizobium + Vermicompost	1453	1888
4.	Rhizobium + PSB + FYM	1535	1995
5.	Rhizobium + PSB + Poultry manure	1412	1835
6.	Rhizobium + PSB + Vermicompost	1431	1860
7.	Rhizobium + PSB	1353	1758
8.	Rhizobium	1350	1755
9.	PSB + FYM	1431	1860
10.	PSB + Poultry manure	1398	1816
11.	PSB + Vermicompost	1414	1838
12.	FYM	1387	1803
13.	NPK	1598	2077
14.	Poultry manure	1376	1788
15.	Vermicompost	1379	1792
16.	Control	1324	1720
	CD at 5% level	98	128

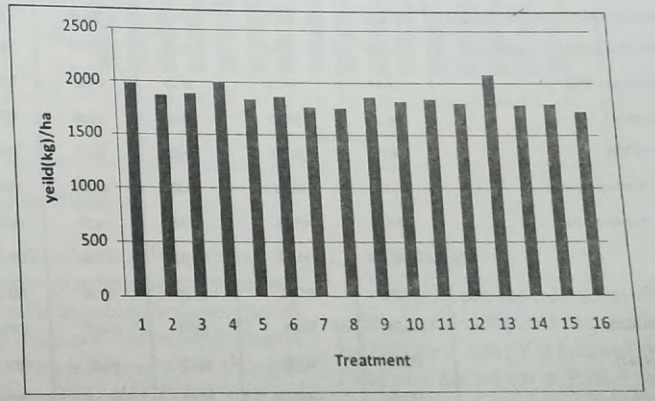

Fig 1: Effect of bio fertilizer and organic manures on yield of fenugreek

application of recommended dose of NPK closely followed by application of PSB + vermicompost, *Rhizobium* + PSB + vermicompost, *Rhizobium* + FYM and *Rhizobium* + vermicompost.Among the biofertilizers treatment and their combinations, maximum seedling length (21.0cm) was recorded when seeds were treated with *Rhizobium* and PSB along with application of farmyard manure and seeds treatment with *Rhizobium* and PSB along with application of vermicompost which was significantly superior over control and statistically at par with *Rhizobium* + poultry manure, *Rhizobium* + FYM, *Rhizobium* + PSB and PSB + FYM.

Maximum seedling dry weight was recorded by application of recommended dose of NPK (73.34 mg) closely followed by the treatments *Rhizobium* + PSB + FYM and *Rhizobium* + PSB + vermicompost.Maximum seedling vigour index-I (2051.6) was obtained when the crop was supplied with recommended dose of NPK and minimum value (1772.5) was recorded in control.maximum seedling vigour index-II (7048.0) was recorded in the treatment *Rhizobium* + PSB + vermicompost which is at par with *Rhizobium* + FYM and *Rhizobium* + PSB + FYM. However, maximum seedling vigour index-II (7165.4) was obtained when crop was supplied with recommended dose of fertilizer (NPK). Maximum values of vigour index-I and II were also observed by the application of recommended dose of NPK was recorded by followed by *Rhizobium* + PSB + vermicompost, *Rhizobium* + PSB + FYM. This might be due to the NPK supply the nutrients in plant by easily and early available to all parts of plant. Moreover, biofertilizers also perform better when soil

Table-2 Effect of biofertilizers and organic manures on quality parameters of fenugreek

Sr. no.	Treatments	Test weight (g)	Germination percentage (%)	Seedling length (cm)	Seedling dry weight (mg)	Vigour index-I	Vigour index-II
1.	Rhizobium + FYM	10.85	96.93	20.33	67.33	1971.2	6527.4
2.	Rhizobium + Poultry manure	10.56	96.90	20.67	66.00	2002.7	6395.4
3.	Rhizobium + Vermicompost	10.34	95.93	18.83	62.33	1806.6	5979.4
4.	Rhizobium + PSB + FYM	10.87	95.60	21.00	70.67	2007.6	6756.1
5.	Rhizobium + PSB + Poultry manure	10.16	95.70	19.33	64.33	1850.4	6157.2
6.	Rhizobium + PSB + Vermicompost	10.59	97.00	21.00	72.67	2037.0	7048.0
7.	Rhizobium + PSB	10.14	95.70	20.83	67.67	1993.5	6473.6
8.	Rhizobium	10.34	95.63	19.67	63.50	1880.7	6089.0
9.	PSB + FYM	10.16	96.03	20.83	66.67	2000.9	6402.3
10.	PSB + Poultry manure	10.19	96.33	19.33	65.00	1862.6	6261.0
11.	PSB + Vermicompost	10.55	97.33	18.83	64.33	1833.6	6259.5
12.	FYM	10.74	96.63	19.83	63.00	1916.4	6089.0
13.	NPK	10.86	97.70	21.00	73.34	2051.6	7165.4
14.	Poultry manure	10.35	95.70	20.83	68.67	1993.9	6571.8
15.	Vermicompost	10.27	96.60	20.67	66.67	1996.7	6441.0
16.	Control	10.10	94.97	18.67	61.33	1772.5	5824.8
	CD at 5% level	0.29	1.30	1.26	6.50	130.4	643.1

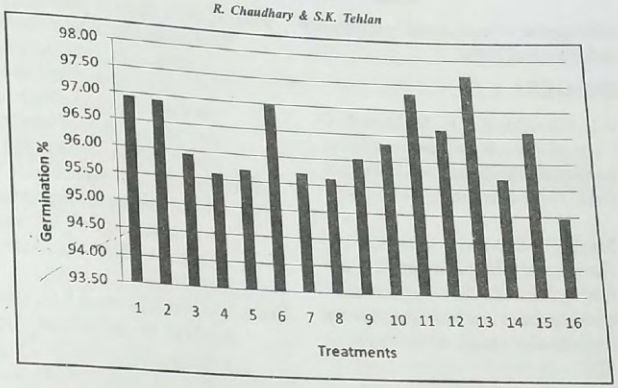

Fig 2:- Germination % of fenugreek

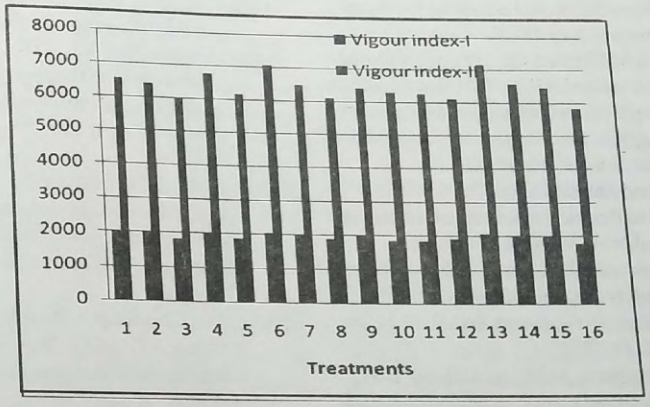

Fig3:- Vigour index of fenugreek

is well supplied with nutrients and then increase the root nodulation through better root development and more uptakes of nutrients, resulting in vigorous growth and quality seed production. The present findings of quality parameters are in agreement with Abdelgani *et al*(1999),Banani *et al(* (2009),Deora and Jitendra(2008), Jat *et al(1999),* Parakhia *et al* (2000), Purbey and Sen (2005).

CONCLUSION

On the basis of the present investigation it could be concluded that seed treatment with *Rhizobium* and PSB along with FYM followed by *Rhizobium* + FYM and *Rhizobium* + PSB + vermicompos significantly increased seed yield and seed qualit parameters while maximum seed yield and seed quali

parameters of fenugreek were observed by application of recommended dose of NPK.

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MOVEMENT OF SOME HEAVY METALS IN DIFFERENT SOIL PROFILES OF SEWAGE IRRIGATED AREAS OF ALLAHABAD, INDIA.

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ABSTRACT

The profilewise movement of heavy metals (Cd, Cr, Pb and Zn) was studied in different soil profiles of sewage irrigated areas of Allahabad. Representative soil samples were collected from three sites which are being irrigated with sewage for last 50 years. The samples were collected from different depths i.e. 0-10, 10-20, 20-30 and 30-40 cm. The soils of these selected sites were composed mostly of recent and old alluvium (ENTISOLS) with some filler soil. Significant proportion of these heavy metals were accumulated in top soil. Maximum accumulation of heavy metals was observed in KAPG College experimental farm soil whereas Naini Sewage farm soil was second in order. Sheila Dhar Institute (SDI) experimental farm soil was least polluted in comparison to KAPG College experimental farm and Naini sewage farm soil.

Key words: Heavy metals, Sewage-sludge, Organic matter, Clay, Soil Profile.

Disposal of sewage-sludge has received much attention as huge amount of these wastes are being produced by urban and industrial activities. As a consequence of these activities, the heavy metal concentration of soils has increased wordwide1 (DC Adriano, 2001). Municipal sludge often contain undesirable chemicals which may be toxic to plants and/or eventually toxic to animals and human that consume edible parts of such plants (Epstain et. al., 1975). Heavy metals accumulate at soil surface through the sewage-sludge application. There is evidence of considerable movement of Zn and to a lesser extent of Cd and Ni, to depths below 15 cm as a result of repeated irrigation for about 70 years with liquid raw sewage; apparently Pb and Cu did not so move (Leeper, G.W. et. al. , 1978). In natural soil profiles cadmium and lead accumulated in the upper part of soil profiles, and the distribution pattern of these elements was similar to that of organic matter (Anderson et. al., 1977). In a soil receiving annual applications of sludge, about 50% the added Zn and Cd had moved to depths below 15 cm during the 6 years after the first application (Hinesly et. al.,1978). The total amount of individual heavy metals in soil solution are usually low. The metal availability (or solubility) depends on a number of factors, including type of colloid, presence of soluble organic ligands, pH, microbial activity, redox potential and aeration (Jones et. al., 1981).

Keeping in view the adverse effects of heavy metal accumulation in soil profiles, an attempt has been made to assess the metallic build-up in soils.

MATERIALS AND METHODS

Soil samples were collected from three selected sites known to have used sewage irrigation These sites were Sheila Dhar Institute (SDI experimental farm, Kulbhasker Ashram Post Gradua College (K.A.P.G.) experimental farm and Nai sewage farm, Allahabad. The samples were collec from different depths i.e., 0-10, 10-20, 20-30 a 30-40 cm. The soils of these selected sites composed mostly of recent and old alluv (ENTISOLS) with some filler soil. A detailed s for the movement of heavy metals in sewage irri soils was taken up.

The soil samples, after being brought to the laboratory, were air-dried, powdered with a wooden hammer and sieved through a 2 mm sieve and stored. The representative soil samples were analysed for four heavy metals i.e Cd, Cr, Pb and Zn. For the total content of these heavy metals, soil samples were extracted with di-acid mixture and for the available content, samples were extracted with DTPA and analysed directly by Atomic Absorption Spectrophotometer (Model-PYE UNICAM SP 2900

Table 1. Physico-Chemical characteristics of the soil (Sewage- irrigated)

	Location		
	Shiela Dhar Institute farm	K.A.P.G. College experimental farm	Naini Sewage Farm
pH	7.5 (7.3)*	7.3 (7.1)	8.2 (7.6)
Organic Carbon%	1.20 (0.45)	0.87 (0.57)	0.95 (0.61)
CEC [Cmol (P^+) Kg^{-1}]	26.7 (17.7)	22.6 (13.5)	30.1 (28.2)
Soil Texture	Sandy loam	loam	Sandy

*(represents non- sewage irrigated soil)

coupled with SP-9 computer and Induced Couple Plasma Model - LABTEM).

Physico-chemical characteristics of the sewage irrigated soil as well as non–sewage irrigated from three different sites are given Table 1:

RESULTS AND DISCUSSION

The distribution of four major pollutants was as follows:

Cadmium: It was observed that the total Cd in sewage irrigated soils is always higher than in the non-sewage irrigated soils. The total Cd concentration in different soils, irrigated with sewage water ranged from 0.2 to 6.1 mg kg^{-1}, against 0.2 to 1.6 mg kg^{-1} in non-sewage irrigated soils (Table 2 to 4). Extractable (available) cadmium also varied in sewage irrigated and non-sewage irrigated soils. In sewage irrigated soils, the amount of DTPA-extractable Cd is much more than in non-sewage irrigated soil. These results indicate that the nature and quality of sewage water affect the availability of Cd in soil.

Chromium: Total Cr concentration in all the soil samples irrigated with sewage water is much higher than the non-sewage irrigated soils. It is further noticed that extractable Cr does not vary much in sewage irrigated and in non-sewage irrigated soil samples from Sheila Dhar Institute experimental farm and KAPG college experimental farm, whereas samples from Naini Sewage soil exhibit variable results. It is clear from Table 2 to 4 that extractable. Cr is affected by the type of the soil. Sheila Dhar Institute experimental farm and KAPG College experimental farm soils are dumped soils whereas Naini soils are normal soils receiving sewage water. Total Cr-content decreased with depth from 9.7 to 1.1 mg kg^{-1}, and 2.3 to 0.4 mg kg^{-1} in 0-40 cm depth in sewage irrigated soil and in normal soil.

Lead: Total Pb concentration in almost all soil samples irrigated with sewage water is much higher than the non-sewage irrigated soil. Total Pb content decreased

with depth from 4.3 to 1.01 mg kg^{-1}; and 1.02 to 0.35 mg kg^{-1} in 0-40 cm depth in sewage irrigated soil and in normal soil respectively. Extractable Pb also decreased with depth in both sewage irrigated soil and in normal soils.

Zinc: In case of Zn, there is not much variation in total Zn in sewage irrigated and in non–sewage irrigated soil samples. But available Zn varies in all the samples. Extractable Zn in sewage irrigated soil is always more than three times that of non-sewage irrigated soils. The increased level of available Zn may, therefore, be inferred to be due to sewage irrigation alone. Most of the sewage irrigated soils contain high amount of total Zn in the sewage (85.21 to 161 mg kg^{-1}). Total Zn shows variable distribution pattern, but DTPA-Zn always decreases with increase in soil depth. In normal soil, total Zn decreased after the 20-30 cm. depth. Extractable Zn decreased with increased in the soil depth.

Colloidal organic matter has a strong affinity for heavy metal cations, and the retention of added metals is often well correlated with the amount of soil organic matter (Hodgson J.F. et. al., 1963). Organic matter may provide sites for cation exchange reaction but its strong affinity for heavy metal cations is due to ligands or groups that form chelates and / or complexes with the metals. The functional groups include COOH, phenolic, alcoholic and enolic–OH, and carbonyl [>C= O] structures of various types (Stevenson et. al., 1972). The retaining ability of organic matter for heavy metals is predominantly through its CEC property rather than chelating ability, and Cd has a tendency to combine with certain chelating groups and become fixed (Haghiri, F, et. al., 1974).

The sub soil can remove a large proportion of any heavy metal that remains in solution in the downward moving water. As the content of organic matter generally decreases with depth in the profile,

Table-2: Movement of heavy metals in sewage irrigated and in non- sewage irrigated soil of SDI experimental farm (mg kg^{-1})

	Cd		Cr		Pb		Zn	
	Total	DTPA-Extractable	Total	DTPA-Extractable	Total	DTPA-Extractable	Total	DTPA-Extractable
Sewage- Irrigated								
A_1 0-10	2.1	0.32	9.7	0.08	4.3	2.7	107	2.23
A_2 10-20	6.1	0.15	2.5	0.07	3.5	1.7	161	1.05
A_3 20-30	4.2	0.13	4.3	0.10	3.1	1.2	131	1.45
A_4 30-40	1.4	0.11	2.7	0.11	1.4	0.8	126	1.75
Non-Sewage Irrigated								
A_1 0-10	1.6	0.02	1.3	0.05	1.01	0.82	107	0.11
A_2 10-20	0.63	0.14	0.7	0.02	0.93	0.35	121	0.25
A_3 20-30	1.3	0.03	0.5	0.04	0.41	0.17	135	0.15
A_4 30-40	0.56	0.02	0.7	0.03	0.37	0.07	115	0.11

Table-3: Movement of heavy metals in sewage-irrigated and in non-sewage irrigated soil of Naini sewage farm (mg kg-1)

Depth (in cm)	Cd		Cr		Pb		Zn	
	Total	DIPA-Extractable	Total	DIPA-Extractable	Total	DIPA-Extractable	Total	DIPA-Extractable
Sewage-Irrigated								
A_1 0-10	2.3	1.7	3.2	2.5	3.5	2.5	90.01	0.61
A_2 10-20	2.3	2.1	4.7	1.7	3.3	1.8	85.21	0.63
A_3 20-30	1.8	0.7	2.1	1.1	2.5	1.4	95.01	0.42
A_4 30-40	1.1	0.2	1.7	0.7	1.2	0.8	90.02	0.31
Non-Sewage Irrigated								
A_1 0-10	1.01	0.76	0.85	0.81	1.02	0.81	75.00	2.01
A_2 10-20	0.97	0.11	0.27	0.21	0.91	0.31	79.00	0.83
A_3 20-30	0.21	0.05	0.17	0.17	0.46	0.15	77.00	0.53
A_4 30-40	0.51	0.03	0.21	0.08	0.37	0.07	75.00	0.72

Table- 4: Movement of heavy metals in sewage-irrigated and in non-sewage irrigated soil of K.A.P.G. College experimental farm (mg kg-1)

Depth (in cm)	Cd		Cr		Pb		Zn	
	Total	DIPA-Extractable	Total	DIPA-Extractable	Total	DIPA-Extractable	Total	DIPA-Extractable
Sewage-Irrigated								
A_1 0-10	1.7	1.4	4.7	0.13	3.7	2.4	105.02	6.21
A_2 10-20	1.3	0.5	3.1	0.15	3.1	1.8	98.00	3.52
A_3 20-30	0.8	0.2	1.7	0.08	2.5	1.2	87.00	4.61
A_4 30-40	0.2	0.07	1.1	0.05	1.2	0.9	85.00	2.22
Non-Sewage Irrigated								
A_1 0-10	0.7	0.3	2.3	0.07	1.01	0.70	103.00	2.63
A_2 10-20	1.0	0.3	1.5	0.05	0.91	0.33	100.21	2.71
A_3 20-30	0.3	ND	0.7	0.6	0.41	0.15	68..62	2.11
A_4 30-40	0.2	ND	0.4	0.04	0.35	0.08	62.51	1.60

Table 5: Ratios of heavy metals in A_1 Vs. A_4 horizon in sewage water irrigated soils

Profile Location	Heavy metals (mg kg^{-1})			
	Cd	Cr	Pb	Zn
1. S.D.I.experimental farm	1.5	3.50	3.07	0.83
2. Naini Sewage from	2.09	1.88	2.91	1.01
3. K.A.P.G.College experimental farm	8.5	4.27	3.08	1.23

the removal is attributable to the increasing content and /or activity of the inorganic colloids. Any downward movement of metals leaching will also be influenced by soil physical properties, including texture and permeability as well as by climate and seasonal variation in rainfall and evaporation (Hodgson J.F. et. al., 1963). The significant factors influencing the availability of heavy metals are soil pH and the quality of soil organic matter(Barancikova et. al., 2003 and Puschenreiter et. al., 2005).

Extent of Contamination

The ratio of metals contents in A_1 versus A_4 horizon can serve as an index of contamination in sewage-sludge irrigated soils. The ratio values greater than 1 indicate metal accumulation in the soil irrigated with sewage water.

The data given in table-5 indicate that the KAPG College experimental farm soil was highly polluted whereas the Naini sewage farm soil second in order. Sheila Dhar Institute (SDI) experimental farm soil was least polluted in comparison to KAPG College experimental farm and Naini sewage farm soil. A low downward movement of heavy metals in all the soil is indicator of its accumulation in the top layer. The Cd, Cr and Pb accumulate in soil as a result of repeated application of sewage–sludge over a long period.

Thus, it may be concluded that a high concentration of extractable heavy metals in surface soils will not only reduce the plant growth but will also affect the availability of other essential elements to plants. Vegetables grown on such soil are liable to contain higher concentration of these heavy metals which are injurious to health. Therefore, there is a need of constant monitoring with the continuous use of sewage water for irrigation.

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PAST AND PRESENT STATUS OF ICTHYOFAUNA DIVERSITY OF ORDER CLUPEIFORMES OF CHNADO,AN OXBOW LAKE OF RIVER MANORMA , BASTI (U.P.)

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ABSTRACT

Freshwater bodies are well known resources for varieties of Icthyofauna . Adverse changes in physicochemical profile make the freshwater bodies unproductive . Chando is an ancient large Oxbow lake of river Manorma, district Basti (U.P.) which covers an area of about 650 hectares in summer and roughly 870-875 hactares during mansoon. It is least polluted and natural lake which harbours different varieties of fishes. Being interior ,no attempt yet has been made to record its Icthyofauna diversity. Present study has, therefore , been undertaken to record the Icthyodiversity of order clupeiformes and compaired the same with the fishes of this order in the past. Fishes of this order include laterally compressed body having keeled and serrated abdomen. In the past, eight fish species has been reported in the freshwater of Eastern (U.P.). However , in our study *Gudusia chapra* , *Ganilosa manmina*, *Setipinna phasa* and *Notopterus notopterus* have been found . However , fishes like *Gudusia godnahiya*, *Hilsa ilisha* , *Ilisha motius* and *Notopteus chitala* are not found since 2009-2011 in this lake. Sailent characters of the fishes of Clupeiformes in Chando lake in recent form has been illustrated and the declining status of other fishes of order Clupeiformes has been discussed.

Key Words *: Clupeiformes, Chando lake, River Manorma, Icthyodiversity*

The Icthyofauna constitute roughly more than one half of all vertebrates comprising about 40,000 species at global level. There prevails no unonimous agreement among the ichthyologists regarding classification of fishes as several ichthyologists have framed there own profile pattern of classification viz., Hamilton ,1822; Day,1878; Goodrich,1909; Jenkins,1910; Regan ,1911; Hora,1923; Stensio,1932; Swainson,1839; Berg,1947; Menon,1949; Chandy,1955; Mishra,1959; Srivastava,1968; Nelson,1944; Jayram,1999 etc. Also Pandey & Shukla ,2011 described geographical distribution of fishes in various zoo geographical realms.

Since after the publication of Srivastava (1968) on "Fishes of Eastern (U.P.) and Bihar", no effort has yet been made to record the icthyodiversity in the freshwater bodies of (U.P.& Bihar) in general and eastern (U.P.) in particular. Keeping this in view , present study has been undertaken to observe orderwise icthyodivesity in Chando, an oxbow lake of river Manorma. Clupeiformes is the first order in our study.

The pattern of classification of the fishes as outlined by Berg (1947) has been followed.

The salient characters of orders Clupeiformes comprises the following.

- Body laterally compressed and silveri
- Abdomen keeled and serrated
- No fin spines
- No lateral line
- Teeth present or absent on jaws

Study has been conducted monthly for last two years (June 2009-May2011) for different catches and prevalence of the fishes of order Clupeiformes in Chando lake has been cited. The findings may be helpful in updating the current status of the fishes of the selected order and may open a key directory of icthyofauna of order Clupeiformes in freshwater bodies in (U.P.& Bihar) in general and eastern (U.P.) in particular. It is to further note that the ecological status of the Chando lake is productive in nature which is well supported by high productive potential as reported by Shukla *et al* (2008,2011).

MATERIALS AND METHODS

The fish specimens of order Clupeiformes were collected with the help of various types of fish catching appliances and devices from various catch point of Chando lake. Some were procured from nearby fish sale market. The specimens were preserved in 8% formalin. Fixed specimens were kept in container with proper labeling and tail pointing upward to avoid damage to the caudal.

Morphometric measurement for various parameters were examined by the methods adopted by Srivastava,1968. Original photographs of the fish specimens were taken by microdigital camera from various angles. Results were computed by using micrometry of various fish species belonging to order Clupeiformes. Arrangement of genus and species were followed according to the Law of Priorty.

RESULTS AND DISCUSSION

Fishes of order Clupeiformes are divided into two sub orders namely Clupeoidei and Notopoteroidei. Suborder Clupeoidei has two families Clupeidae and Engraulidae. Family Clupeidae includes two sub-Families namely Clupeini and Dorosomatini. In our study single fish namely *Gudusia chapra* belongs to sub family Clupini where as the sub family Dorosomatini and family Engraulidae also include single fish namely *Ganialosa manmina*. and *Setipinna phasa* respectively. Suborder Notopteroidei has single family Notopteridae and it also contains single fish species namely *Notopterus notopterus*.

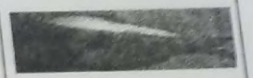
Their characters along with common name and original photographs and the present status when compared with past in the freshwaters of eastern (U.P.) is cited in Table 1.

In the survey made by Srivastava (1968) total eight species were found in Chando lake. However, in our observations only four fishes have been found. By and large all the fishes are small scaled fishes except feather

Table 1 : Showing Fishes of order Cypriniformes and their sub order , families and sub families from Chando lake Basti (U.P.). Prevalence status is form June 2009 to May 2011.

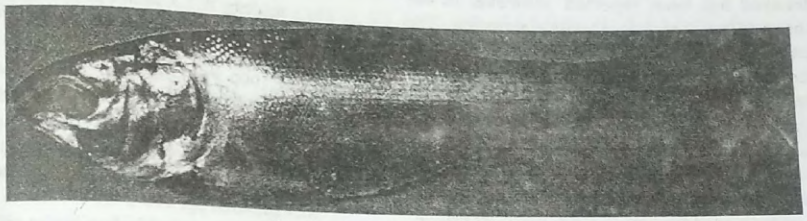
Order-Clupeiformes			
Suborder-Clupeoidei			Suborder-Notopteroidei
Family-Clupeidae			
Sub-Family-Clupeini	Sub-family-Dorsomatini	Family-Engraulidae	Family-Notoptereridae
Zoological Name/ Common Name	Zoological Name/ Common Name	Zoological Name/ Common Name	Zoological Name/Common Name
Gudusia chapra (Ham.) / Khoira, Suhiya.	*Gonialosa manmina* (Ham.) /Khoira/Majhali Suhiya.	*Satipinna phasa* (Ham.) / Phasa.	*Notopterus notopterus* (Pallas) / Patra,Phulo, Golhi
Total 1	1	1	1

Table 2 : Showing salient characters, morphometric measurement, fin formula and original photographs of various fishes of Chando lake of order Clupeiformes.

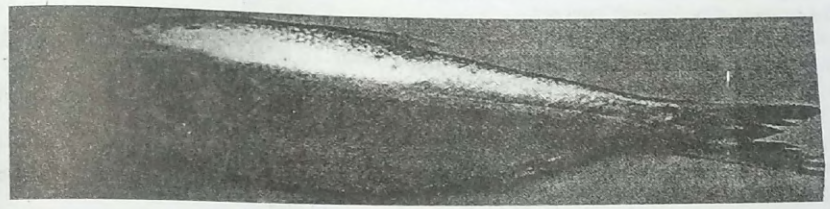
Order-Clupeiformes			
Suborder/Families & their subfamilies	Zoological Name /Common Name	Salient Characters / Morphometric measurement / Fin formula	Original Photographs
suborder-Clupeoidei Family-Clupeidae Subfamily-Clupeini	*Gudusia chapra* (Ham.)/Suhiya,Kohira	**Salient Characters** 1. Ventral profile more convex than dorsal profile. 2. Insertion of Pelvic fins just before dorsal fin origin. 3. Upper jaw with distinct median notch at centre. 4. Scales small,80-97 scales present in lateral series. 5. Dark blotch behind gill opening after followed by a series of spots along flank. 6. Maximum Size-15 Cm. **Morphometric Measurement-** (a) **Total length-11.7 Cm** (b) **Standard length-6.7 Cm** **Fin Formula-** D.14-15(3/11-12); P.13; V.8;A.22-24 (2/20-22); C.17; L.r.80-97,L.tr.33-35	
suborder-Clupeoidei Family-Clupeidae Subfamily-Dorsomatini	*Gonialosa mamina*(Ham.) /Majhali Suhiya,Kohira	**Salient Characters** 1. Body fairly deep, compressed and ventral profile more convex than dorsal profile. 2. Pre-dorsal scales paired and overlapping in mid line. 3. Mouth interior , Upper jaw slender at tip. 4. Pelvic origin a little in front of dorsal origin. 5. Scales small , 55-58 in lateral series. 6. Colour : Silvery 7. Maximum size- 12.2 cm **Morphometric measurement:** (a) **Total length-12.0Cm** (b) **Standard length-9.7 Cm** **Fin Formula:** D.14-15(3/11-12); P.15; V.8;,A.22-25 (2/20-30); C.21; L.r.55-58,L.tr.23.	

suborder-Clupeoidei Family-Engraulidae	*Setipinna phasa*(Ham.)/Phasa,Phansi.	**Salient Characters** 1. Body elongated,compressed but not tapering. 2. Pectoral filament long reaching to middle of anal fin. 3. Anal not confluent to caudal fin. 4. Caudal fin forked its upper lobetruncated and shorter than lower lobe. 5. Pectoral fin black in adult. 6. Colour-Silver white. 7. Maximum size-22.8 Cm **Morphometric. measurement-** **(a) Total length-41.7 Cm** **(b) Standard length-9.3 Cm** **Fin Formula:** D.14-15(3/11-12);P.14-15; V.7;,A.71-75 (2/20-30); C.19; L.r.52,L.tr.14.	
suborder- Notopteroidei Family- Notopteridae	*Notopterus-Notopterus (Pallas)/ Patara,Phulo, Golhi*	**Salient Characters** 1. Maxilla (gape of mouth) extends to middle of eyes. 2. Preorbital serrated. 3. There ia a district median groove on the summit of head. 4. There being also a hallow space called Parietomastoid cavity. 5. Cheekscales are comparatively large than the body scale. 6. Lateral line straight and complete. 7. Colour : varies according to ecological condition. 8. Maximum size-24 Cm **Remark-** Vertical row count differs from that given by Day, it is 30-60 and not 15-54. **Morphometric measurement-** **(a) Total Length -17 Cm** **(b) Standard length -14.6 Cm** **Fin Formula:** D.8(1/7); P.17; V.6;A.100 C.19; L.l.225; Vert.30/60.	

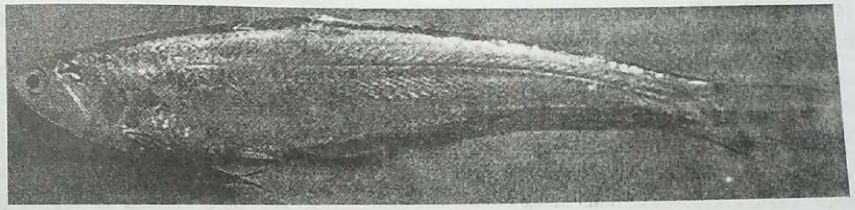
FISHES OF ORDER CLUPEIFORMES FROM CHANDO LAKE BASTI (UP).



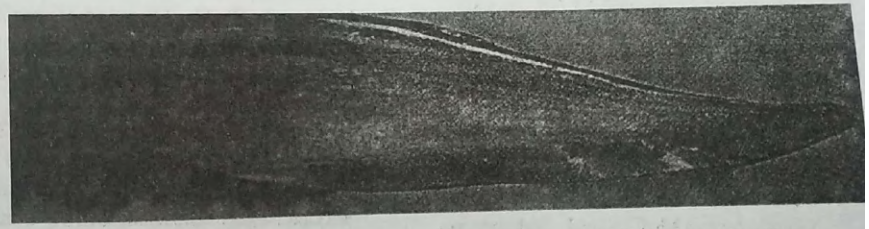
Gudusia chapra(Ham.)



Gonialosa manmina (Ham.)



Setipinna phasa (Ham.)



Notopterus notopterus (Pallas)

back *(Notopterus notoperus)*. The another fish *N.chitala* belonging to family notopteroidei in the last decayed has been reported .However in our observations, *N.chitala* is totaly absconding. The reason might be due to its delicious edibility and much demand. Other fishes like *Hilisha ilisha* has not been reported in the freshwater bodies of eastern (U.P.) which might be attributed to the building up of the Farraka dam which inhibited its migratory nature. However, the declining in the diversity of two species namely *Ilisha motius* and *Gudusia godnahiya* may be an account of their small sizes which are caught through the traditional cast nets that prevents even the escaping of the fries and fingelings.

Present study thus may be of high importance from the fish taxonomy view point which reveals the prevalence status of the fish species belonging to order Clupeiformes at present, when compared with the past century as reported by Srivastava (1968). No other reason may be claimed for declining diversity in the reported fish species because the survey reveals that our study lake is uncontaminated rather highly fresh.

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TO CALCULATE NUTRIENT CONTENT OF THE DEVELOPED PRODUCTS BY USING MAHUA FLOWER *(MADHUCA INDICA)* FLOUR, WHEAT FLOUR AND SOYA FLOUR.

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ABSTRACT

Nutrients obtained from the chemical analysis of the fresh and dehydrated mahua flower are moisture, ash, protein, carbohydrate, fats, calcium, and phosphorus. The statistical analysis revealed that the mahua flower flour can be satisfactory mixed with soya flour, wheat flour to prepare nutritional products. (T_4, wheat flour-50 percent, mahua flower flour-40 percent, soya flour-10 percent.) was found highest score in terms of all sensory attributes colour and appearance, taste and flavour, texture, over all acceptability.The calculated nutritive value of products showed that as the percentage of soya flour increased the energy, protein, carbohydrate, phosphorus, calcium also increases. Over all it was concluded (T_4) of all form prepared products from mahua flower flour, soya and wheat flours was found to be most acceptable.

Key Words : Nutrient Content, Mahua Flower, Wheat flour, Soya flour.

Mahua flowers are known as energy rich material and used as animal as well as human food. Flower are used for local wine,The distillation product of flowers gives a spirit which has healing astringent, tonic and appetizer properties. Flowers are used as sweet, some ethnic food like chapatties are prepared by tribal women, mahua cake is used as manure. It has pesticidal properties. Nutritive value in 100 grams of Mahua like energy, moisture, protein, fat, carbohydrate, calcium, iron and phosphorus. Energy-111 kcal, moisture-74g, protein- 1.4g, fat-2g, mineral-1g, carbohydrate-23g, calcium-45mg, phosphorus-22mg *(Gopalan,et al. 2004)*.

Mahua flowers are useful in bronchitis and cough. They should be given in doses of 250 ml of milk. The oil extracted from the madhuka seeds has laxative properties. It help curing piles and relieving chronic constipation. The leaves of the tree take are useful in the treatment of eczema.The leaves, smeared with oil, warmed over fire and bandaged on the affected parts provide relief. They should be changed after every 3 to 4 hours. This ash of the leaves mixed with ghee is often used as dressing for burns and scalds indigenous system of medicine for the cure of itching, for used a paste of the bark is applied. oil extracted from the seeds can also be applied locally in skin disease. Flowers of the madhuka are effective in increasing the flow of milk in nursing mothers. Seeds also have a similar properties.

MATERIALS AND METHODS

The study was carried out in the Foods and Nutrition laboratory of Halina School of Home Science, SHIATS, Allahabad UP.

Coollection of materials: All the materials required for the study were collected from the local market of Allahabad.

Details of Control and Treatments-

Control (T_0) : In this control standardized produc prepared with 100% wheat flour

Treatment T_1 : In this treatment the products prepar with 50% wheat flour, 25% mahua flour, 25% s flour.

Treatment T_2: In this treatment the products prepared with 50% wheat flour, 30% mahua flour, 20% soya flour.

Treatment T_3: In this treatment the products prepared with 50% wheat flour, 35% mahua flour, 15% soya flour.

Treatment T_4: In this treatment the products prepared with 50% wheat flour, 40% mahua flour, 10% soya flour.

Development of products: "Ladoo" and "Poori" were developed by incorporating Mahua flower flour and soya flour in wheat flour at four different levels of incorporation.

Organoleptic evaluation

Sensory evaluation of the products was done by a panel of five judges selected from the Halina School of Home Science. colour and appearance, texture, flavour, taste and overall acceptability were evaluated by using the nine point hedonic scale based score card.(**Srilakshmi,2007**).

Statistical Analysis

The data was statistically analysed by using analysis of variance (two way classification) and critical difference (**Fisher,1995**).

RESULTS AND DISCUSSION

The data collected on different aspects as per the methodology have been tabulated and analyzed statistically. The results obtained from the analysis are presented and discussed in this chapter

1. Chemical analysis of Mahua flower fresh and dehydrated.

a) Moisture (%)
b) Ash (mg)
c) Total carbohydrate (g)
d) Protein (g)
e) Fat (g)
f) Phosphorus (mg)
g) Calcium (mg)

2. Organoleptic properties of developed products
a) Colour and appearance
b) Texture
c) Taste and flavour
d) Overall acceptability

3. Nutritive value calculation of the developed products.
a) Energy
b) Protein
c) Carbohydrate
d) Fat
e) Calcium
f) Phosphorus
g) Iron

The highest score obtained for colour and appearance of *laddu* from Mahua flower, soya and wheat flours was recorded (8.14) in T_4 followed by (8.08) in T_0, (7.92) in T_1, (8.2) in T_2,(8.12) in T_3. The highest score obtained for texture of *laddu* from Mahua flower, soya and wheat flours flour was recorded (8.12) in T_4 followed by (7.6) in T_0, (7.36) in T_1, (7.16) in T_2,(7.38) in T_3. The highest score obtained for taste and flavour of *laddu* from Mahua flower, soya and wheat flours was recorded (8.58) in T_4 followed by (7.56) in T_0, (7.52) in T_1, (7.68) in T_2,(7.6) in T_3. The highest score obtained for over all acceptability of *laddu* from Mahua flower, soya and wheat flours with wheat flour was recorded (8.48) in T_4 followed by (7.26) in T_0, (7.56) in T_1, (7.54) in T_2,(7.4) in T_3.

The highest score obtained for colour and appearance of *poori* from Mahua flower, soya and wheat flours was recorded (9.68) in T_4 followed by (7.84) in T_0, (7.8) in T_1, (7.8) in T_2,(7.72) in T_3. The highest score obtained for texture of *poori* from Mahua flower, soya and wheat flours was recorded (8.84) in T_4 followed by (7.76) in T_0, (7.84) in T_1, (7.64) in T_2,(7.88) in T_3. The highest score obtained for taste and flavour of *poori* from Mahua flower, soya and wheat flours was recorded (8.12) in T_4 followed by (7.28) in T_0, (7.66) in T_1, (8.0) in T_2,(7.8) in T_3. The highest score obtained for over all acceptability of *poori* from Mahua flower, soya and wheat flours was recorded (8.96) in T_4 followed by (7.68) in T_0, (7.56) in T_1, (7.44) in T_2,(7.34) in T_3.

Table.2.1 shows that T_4 was high in content of energy (kcal) followed by T_1(401.2) Followed by T_2(300.3), T_3 (276.3), T_4 (228.05) and then T_0 with 180.8.

T_1(21.47) was high In Protein followed by T_2 (15.81), T_3(14.02), T_4 (5.02) and then T_0 with 7.05. T_1 (48.45) Was high in Carbohydrate followed by T_2(46.39) ,T_2 (45.69), T_3(46.20), and then T_0 with 36.6.T_2(6.61) was high in fat followed by T_1(5.52), T_3(5.12),T_4 (4.91) and then T_0 with 2.20T_2(400.14) was high in calcium followed by T_3 (387.1),T_4(350.1) and then T_0 with 24. T_2(3.20) was high in phosphorus followed by T_3(288.6), T_4 (254) and then T_0 with 177.4 . T_1 was high in iron (5.1) Followed by T_2 (4.49), T_3 (4.05) ,T_4 (3.48) . T_1(6.1) , T_0 with (2.45).

Table.2.2 shows that T_1(302) was high in content of energy (kcal) followed by T_2(289) T_3(272.12), T_4

Organoleptic Evaluation-

Table 1.1-Average scores for different sensory parameters of *laddu* prepared from Mahua flower, Soya and wheat flours.

Parameters	Treatments					F 'cal'	F 'tab'	Result
	T_0	T_1	T_2	T_3	T_4			
	Mean± SE	Mean± SE	Mean±SE	Mean±SE	Mean± SE			
Colour and appearance	8.0±2.28	7.9±2.2	8.2±2.3	8.1±2.2	8.1±2.2	3.87	3.01	S
Texture	7.6±2.49	7.3±2.0	7.1±2.0	7.3±2.0	8.1±2.2	2.67	3.01	NS
Taste and flavour	7.5±2.13	7.2±2.1	7.6±2.1	7.6±2.1	8.5±2.4	12.1	3.01	S
Over all acceptability	7.2±2.05	7.5±2.1	7.5±2.1	7.4±2.1	7.±2.09	0.01	3.01	NS

Table1.2-Average score for different sensory parameters of *poori* prepared from mahua flower soya and wheat flours.

Parameters	Treatments					F 'cal'	F 'tab'	Result
	T_0	T_1	T_2	T_3	T_4			
	Mean± SE	Mean± SE	Mean±SE	Mean±SE	Mean± SE			
Colour and appearance	7.84±2.1	7.8±2.2	7.8±2.2	7.7±2.1	9.6±2.7	0.04	3.01	NS
Texture	7.7±2.1	7.8±2.0	7.6±2.2	7.8±2.2	8.8±2.3	0.08	3.01	NS
Taste and flavour	7.2±2.0	7.6±2.1	8.0±2.2	7.8±2.2	8.1±2.2	7.82	3.01	S
Over all acceptability	7.6±2.17	7.5±2.1	7.4±2.1	7.3±2.0	8.9±2.5	1.61	3.01	NS

(225), and then T_0 with 170. T_1 (20.47) was high in Protein followed by T_2 (14.91), T_3 (13.03), T_4 (4.10) and then T_0 with 6.02. T_3 (46.60) was high in Carbohydrate followed by T_2 (46.53) ,T_1 (45.50), T_4(46.15), and then T_0 with 34.2T_1 (6.23) was high in fat followed by T_2 (5.12), T_3 (3.71),T_4 (3.40) and then T_0 with 1.11T_2 (84.2) was high in calcium followed by T_3 (74.5),T_4(41.5) and then T_0 with 22. T2 (320) Was high in phosphorus followed by T_4(288.7), T_4 (255.1) and then T_0 with 171.5 . T_1(5.0) Was high in iron Followed by T_2 (4.21), T_3 (4.03) ,T_4 (3.55) . T_1 (5.0) and then T0 with (3.55).

Table.2.1 Comparison of nutritive value of different treatments of *laddu* from mahua flower, soya and wheat flours.(Per 100 gm)

Nutrients	Treatments				
	T_0	T_1	T_2	T_3	T_4
Energy (kcal)	180.8	401.2	300.3	276.3	228.95
Protein(g)	7.05	21.47	15.81	14.02	5.02
Carbohydrate(g)	36.6	48.45	46.39	45.20	45.15
Fat (g)	2.20	5.52	6.61	5.12	4.91
Calcium (mg)	26	68	86.8	77.7	44.5
Phosphorus(mg)	190.2	300	400.14	387.1	350.1
Iron (mg)	2.45	6.1	5.19	4.85	3.98

Table.2.2 Comparison of nutritive value of different treatments of *poori* from mahua flower, soya and wheat flours.(Per 100 gm)

Nutrients	Treatments				
	T_0	T_1	T_2	T_3	T_4
Energy (kcal)	170	302	289	272.12	225
Protein(g)	6.02	20.47	14.91	13.03	4.10
Carbohydrate(g)	34.2	45.50	46.53	45.60	46.15
Fat (g)	1.11	6.23	5.12	3.71	3.40
Calcium (mg)	22	63.5	84.2	74.5	41.5
Phosphorus(mg)	171.5	243.2	320	287.7	255.1
Iron (mg)	1.45	5.0	4.21	4.03	3:55

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A STUDY OF DIETARY PATTERN OF INDUSTRIAL WORKERS

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ABSTRACT

Workers health status usually reflects the general health conditions of population. Hundred industrial workers in the age group of 35-65 years were selected by random sampling technique from industries of Kanpur namely heer biscuits, multiexports international, parle-g biscuit, jaina detergent and parag industry. Survey method was adoped in order to collect the data from the selected respondents with the help of pre tested standardized interview schedule. The pattern of food intake revealed that a large proportion of respondents do not take eggs and fruits it may be due to low socio-economic condition. On the other hand a good percentage of the industrial workers take cereals because it is cheapest and major source of dietary energy.

Key Words: adequate diets, food pattern, dietary energy

The importance of the nutrition of the industrial worker began to be appreciated in this country soon after the outbreak of war in 1939. In many cases no amount of education in diets would be of very much help, for conditions are such as to make it almost impossible for the worker to obtain a good diet. There have been several country-wide Diet and Nutrition surveys in India. But few of these pertain to industrial workers and cover such aspects as common nutritional disorders and dietary intake (De Mello et al. 1950; Banerjee et al. 1959; Ramanamurthy and Dakshayani 1962; Swaminathan 1967; Sharan and Puttaraj 2003) and work output .

Thus more attention needs to be given to obtain data on the physical and nutritional status of different categories of workers in different income groups, their knowledge and practices regarding health and nutrition. This enables formulation of sound and effective nutrition education action programmes for promoting worker health and nutritional status. In industrial workers, the higher levels of cholesterol, lipid peroxides and uric acid are observed due to pollutants like smoke, tar or high furnace temperatures. The incidence of hypertension is greater in industrial workers as compared to rural workers(Satyanarayana et al. 1979).

MATERIALS AND METHODS

Research methodology is the plan, structure and strategy of investigation, so as to obtain answer to research question and control variance plan in the overall scheme.

(i) Location of study- The study was conducted in different industries of Kanpur such as Heer biscuit, Parley, Parag, Indcoat food wear, Ashok masala industry etc.

(ii) Sample Selection - 100 industrial workers were selected for the study which was selected from different industries through random sampling. The nutrient intake information of the subject was collected with the help of questionnaire.

(iii) Period of study - January to May, 2010

(iv) Collection of Data- The primary tool used in the study was a detailed performa. The information was obtained from the respondents by questionnaire cum interview method. Each subject was contacted individually and was persuaded to answer all the questions in the questionnaire and their responses were recorded.

The questionnaire was divided under the following

heads:-

1. General Information
2. Dietary Information

General Information: - With the help of questionnaire the general information was collected like name, age, gender, address, and type of family, number of family members, religion, and monthly income of the respondents.

Statistical Tools:- The Collected data were classified in the light of the objective of study. The classified data were, tabulated and analyzed statistically with the helps of approved statistical techniques.

Percentage

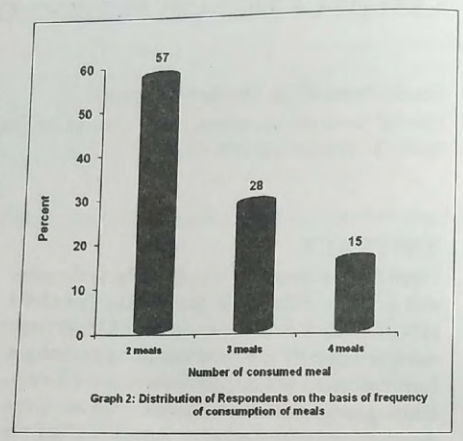
The percentage values are calculated to make simple comparison.

$$\text{Percentage} = \frac{n}{N} \times 100$$

Where,

n = Number of respondents in the event.

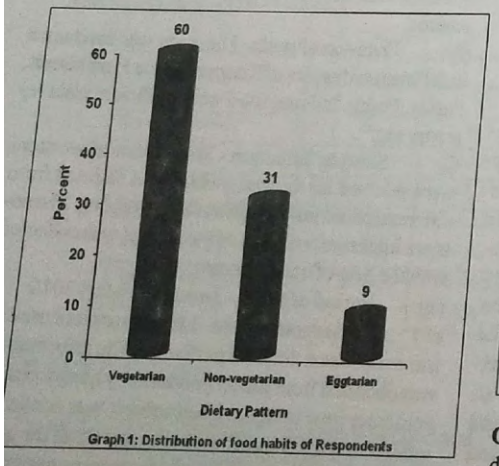
N = Total Number of respondents



Graph 2: Distribution of Respondents on the basis of frequency of consumption of meals

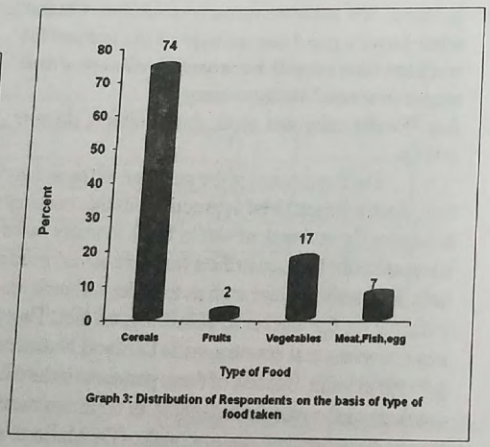
Graph 2: shows that 57.0 percent respondents were taking 2 meals in a day 28.0 percent respondents were taking 3 meals in a day and 15.0 percent respondents were taking 4 meals in a day.

RESULTS AND DISCUSSION



Graph 1: Distribution of food habits of Respondents

Graph 1: shows that maximum 60.0 percent respondents were vegetarian, 31.0 percent respondents were non-vegetarian and 9.0 percent respondents were eggtarian.



Graph 3: Distribution of Respondents on the basis of type of food taken

Graph 3: shows that maximum 74.0 percent respondents were taking cereals, 17.0 percent respondents were taking vegetables, 7.0 percent respondents were taking meat, fish, egg and minimum 2.0 percent respondents were taking fruits.

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SURVEY AND ASSESSMENT STATUS OF *HELICOVERPA ARMIGERA* ON TOMATO CROPS IN PUSA BLOCK UNDER SAMASTIPUR DISTRICT OF BIHAR

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ABSTRACT

Helicoverpa armigera (Hub.) is the most dominant pest of tomato in the northern part of Bihar. The appearance of *H. armigera* larvae observed from last week of December to first week of January and average fruit damage was 35.09 per cent on tomato at farmer's field. It is reported that timely transplanting or early transplanting of tomato crop minimizes the yield losses due to *H. armigera*. The maximum moth population was reported in February in two consecutives years. It was determined that the temperature and relative humidity plays an important role in increasing the larval population. Yield losses of due to *H. armigera* vary from 36.09 to 48.67 per cent in different locality.

Key words : Survey, Assessment, Tomato, *Helicoverpa armigera*.

Tomato, *Lycopersican esculantus* Linn. is one of the most important vegetable crops of farmers in Bihar. This state accounts approximately 10-11 per cent of the total area covered under vegetable cultivation. An array of land races, accession, hybrids and improved tomato varieties are cultivated by these farmers to satisfy the consumer preference for colour, shape and another culinary traits.

Helicoverpa armigera (Lepidoptera : Noctuidae) is one of the most devastating pest world wide and feeds on more than 300 plant species and solely responsible for considerable damage to many field and horticultural crops (Arora *et al.*, 2005). The larvae of this pest feed on large variety of agricultural crops, important ones being chickpea, pigeonpea, cotton, tomato, groundnut, sunflower and mustard and causes heavy losses (Bajya and Monga, 2009). The problem of this pest is magnified due to its direct attack on fruiting structure, voracious feeding habit, high mobility and fecundity, multivoltine nature, overlapping generation with facultative diapause, nocturnal behaviour, migration, host selection by learning and propensity for acquiring resistance against wide range of insecticides (Sarode, 1999). In tomato, the eggs are laid on leaves and other tender parts of the plants. The larvae initially feed on the young leaves, and consume the developing fruits. The larvae also damage the fruiting bodies and vegetative positions in several other crops (Gowda and Sharma, 2005). Hence proper survey of this pest is needed for devising suitable management strategy in part of northern Bihar.

MATERIALS AND METHODS

In Samastipur district Pusa Block have comprises of 13 panchayat in which eight dominant vegetable growing panchayats were selected for studies. Two villages were selected in each panchayat and each villages 10 farmers of different category were selected and studied for the status of *Helicoverpa armigera* in tomato crops during rabi, 2009 and 2010. A questionnaire for farmers was developed in Hindi for their responses. There were 10 farmers in each village and two village in each panchayat were selected, so total farmers as a sample were 160 in number. Purposive sampling of villages was adopted keeping in view to tomato growing areas for these 10 farmers were selected in one village. Thus 160 farmers

were studied with a specially developed schedule. The responses of the farmers were collected by personal interview method. Lists of all tomato growers were selected randomly for the study. The primary data were collected from selected farmers with the help of pretested interview schedule and the secondary data related to the Front Line Demonstration (FLD) were collected from the office of Krishi Vigyan Kendra, Birauli, Samastipur from their published and unpublished records. The study was undertaken during 2008-09 and 2009-10.

Steps involved in finding out the status of *Helicoverpa armigera* and their management in block Pusa were as, data collection (from block headquarter, Pusa), selection of village, selection of farmers, developed questionnaire schedule (Hindi), personal interview, data analysis and tabulation surveyed information and validation of indigenous technical knowledge through experimentation.

On the basis of developed questionnaire and personal interview data were prepared on the pest pressure in different villages. Besides, synthetic insecticides, bio-rational insecticides, natural insecticides viz., neem leaf extract, tobacco extract, cow urine and their combination at different doses adopted by farmers to control the *Helicoverpa armigera* were also noted one.

RESULTS AND DISCUSSION

Appearance of *H. armigera* larvae on farmer's fields

Results related appearance of larvae in tomato crops on farmer's field presented in Table 1 and 2 for rabi season 2008-09 and 2009-10. Tomato growers of the block Pusa reported timely transplanting 64.06 per cent and 35.94 per cent late transplanting in 2008-09 and appearance of *Helicoverpa armigera* larvae observed 30.66 DAT in timely transplanted tomato crops and 27.22 DAT in late transplanted tomato crops as whole average of block. Appearance of larvae of *Helicoverpa armigera* observed from the last week of December to first week of January in tomato crops at farmers field. The appearance of larvae were late in village Chainpur, panchayat Dhobagama i.e. 34.25 and 32.34 DAT in timely transplanted and late transplanted, respectively and appearance were early in village Jankinagar, panchayat - Chakale Waini i.e. 26.38 and 23.45 DAT in timely and late transplanting, respectively in 2008-09. Appearance of larvae in block were observed from transplanting to 30.66 days after on timely transplanted tomato crops and from 27.22 days after transplanting in case of late transplanted tomato crops in the year 2008-09. These findings are in accordance with the work of Shah and Shahzal (2005).

Tomato growers of the block Pusa reported timely transplanting (75.19%) and late transplanted (24.81%) in 2009-10 and appearance of *Helicoverpa armigera* larvae observed 34.73 DAT in timely transplanted crops and 32.64 DAT in late transplanted crops. Appearance of larvae of *Helicoverpa armigera* observed in first fortnight of January in tomato crops. The appearance of larvae were late in village Srirampur panchayat - Bathua i.e. 36.14 and 34.62 DAT in timely transplanted and late transplanted, respectively and appearance were early in village Karmaila, panchayat -Morsand i.e. 32.35 in timely transplanted tomato crop and 31.22 DAT in village Bisanpur, panchayat - Chakale Waini in late transplanted crop during 2009-10. Appearance of larvae in block were observed 34.73 days after transplanting on timely transplanted tomato fields and from 32.64 days after transplanting in case of late transplanted tomato crops in 2009-10.

Larval population and fruit damage

The larvae of *Helicoverpa armigera* appeared by the end of December (Table 1 & 2) and attended peak in third week of February. The population declined in second week of March. The larval population varied from 4.97 to 8.36 per 5 plants in farmers field of Pusa block (Table 3). The overall average larval population of block were 7.20 and 7.10 per 5 plant during 2008-09 and 2009-10. The maximum larval population (8.36 and 8.07) was observed in Birauli and Gopalpur village of Taharo Gopalpur panchayat followed by Srirampur (8.05)

Table 1 : Appearance of *H. armigera* larvae on tomato crops of different villages of block Pusa, 2008-09.

Sl. No.	Panchayat/ village	Transplanting period (Farmers in per cent)		Appearance of *H. armigera* larvae		Month	
		Timely transplanting	Late Transplanting	Days after Transplanting (DAT)			
		Group I	Group II	Group I (mean)	Group II (mean)	Group I	Group II
1.	Morsand						
i.	Bahadurpur*	65	35	32.13	28.35	1st fortnight of Jan.	Last week of Dec. to 1st week of Jan.
ii.	Karmaila	50	50	30.65	27.63		
2.	Chakale Waini						
i.	Bisanpur	45	55	29.45	24.38	Last week of Dec. to 1st week of Jan.	Last week of Dec. to 1st week of Jan.
ii.	Jankinagar	65	35	26.38	23.45		
3.	Chandauli						
i.	Bathauna	70	30	32.14	25.36	Last week of Dec. to 1st week of Jan.	Last week of Dec. to 1st week of Jan.
ii.	Chandauli	55	45	30.32	27.65		
4.	Taharo Gopalpur						
i.	Birauli	45	55	29.45	27.33	Last week of Dec. to 1st week of Jan.	Last week of Dec. to 1st week of Jan.
ii.	Gopalpur	75	25	28.24	25.46		
5.	Harpur						
i.	Narayanpur	55	45	27.12	25.29	Last week of Dec. to 1st week of Jan.	Last week of Dec. to 1st week of Jan.
ii.	Harpur	79	30	28.59	26.35		
6.	Dighra						
i.	Gadya	65	35	32.33	29.62	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Nawachak	80	20	34.15	31.09		
7.	Bathua						
i.	Dharampur	75	25	33.04	30.66	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Srirampur	60	40	32.83	29.75		
8.	Dhobagamma						
i.	Chainpur	70	30	34.25	32.34	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Jagdishpur	80	20	33.64	31.50		
	Block average :	64.06	35.94	30.66	27.22		

Table 2 : Appearance of H. armigera larvae on tomato crops of different villages of block Pusa, 2009-10.

Sl. No.	Panchayat/ village	Transplanting period (Farmers in per cent)		Appearance of *H. armigera* larvae		Month	
		Timely transplanting	Late Transplanting	Days after Transplanting (DAT)			
		Group-I	Group-II	Group-I (mean)	Group-II (mean)	Group-I	Group-II
1.	Morsand						
i.	Bahadurpur*	72	28	34.26	32.64	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Karmaila	55	45	32.35	32.45		
2.	Chakale Waini						
i.	Bisanpur	78	22	33.62	31.22	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Jankinagar	70	30	34.37	32.36		
3.	Chandauli						
i.	Bankurwa	88	12	36.22	32.00	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Chandauli	72	28	33.46	31.25		
4.	Tahara Gopalpur						
i.	Birauli	78	22	34.67	33.82	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Gopalpur	72	28	35.34	33.36		
5.	Harpur						
i.	Narayanpur	72	28	34.85	32.24	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Harpur	78	22	35.74	32.00		
6.	Dighra						
i.	Gariya	82	18	34.62	31.60	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Nauwachak	68	32	33.74	33.34		
7.	Bathua						
i.	Dharampur	78	22	35.13	31.25	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Srirampur	70	30	36.14	34.62		
8.	Dhobagamma						
i.	Chainpur	92	8	35.27	33.78	1st fortnight of Jan.	1st fortnight of Jan.
ii.	Jagadishpur	78	22	35.84	34.15		
Block average :		75.19	24.81	34.73	32.64		

Table 3 : Incidence of H. armigera in tomato crops of different villages of block Pusa.

Sl. No.	Panchayat/ village	Mean larval population (No./5 plant			Mean fruit damage (%)			Marketable fruit yield (q/ha)			Yield losses** (%)
		2008-09	2009-10	Mean	2008-09	2009-10	Mean	2008-09	2009-10	Mean	
1.	Morsand										
i.	Bahadurpur*	5.12	6.24	5.68	29.25	30.54	29.90	178.54	185.75	182.15	47.95
ii.	Karmaila	4.80	5.15	4.97	31.72	30.81	31.27	228.34	214.86	221.60	36.08
2.	Chakale Waini										
i.	Bisanpur	6.45	6.93	6.69	39.31	44.42	41.86	193.15	182.36	187.76	46.35
ii.	Jankinagar	7.26	7.19	7.23	40.67	42.55	41.61	182.52	176.80	179.66	48.67
3.	Chandauli										
i.	Bankurwa	7.91	7.16	7.54	46.43	45.26	45.85	227.62	219.76	223.69	36.09
ii.	Chandauli	6.63	7.95	7.29	44.25	43.38	43.82	200.31	207.65	203.98	41.72
4.	Tahara Gopalpur										
i.	Birauli	9.15	7.56	8.36	39.62	36.25	37.94	210.46	200.91	205.69	41.23
ii.	Gopalpur	8.62	7.51	8.07	41.51	42.60	42.06	200.12	191.35	195.74	44.07
5.	Harpur										
i.	Narayanpur	8.67	6.45	7.56	46.27	48.42	47.35	203.25	208.05	205.65	41.24
ii.	Harpur	7.52	7.34	7.43	36.65	35.37	36.01	198.19	203.27	200.73	42.65
6.	Dighra										
i.	Gariya	7.49	7.25	7.37	27.80	24.76	26.28	194.80	200.36	197.58	43.54
ii.	Nauwachak	6.62	7.43	7.03	24.46	25.52	24.99	185.61	191.25	188.43	46.20
7.	Bathua										
i.	Dharampur	7.96	7.32	7.64	29.24	31.65	30.45	190.15	183.77	186.96	46.58
ii.	Srirampur	8.64	7.45	8.05	33.48	32.71	33.10	200.08	214.12	207.10	40.83
8.	Dhobagamma										
i.	Chainpur	6.53	7.92	7.23	24.21	22.35	23.28	190.14	184.62	187.36	46.46
ii.	Jagadishpur	5.84	6.80	6.32	26.63	24.72	25.67	195.28	187.15	191.22	45.37
Block Average :		**7.20**	**7.10**	**7.15**	**35.09**	**35.08**	**35.09**	**198.65**	**197.00**	**197.83**	**43.48**

village of Bathua panchayat. Pest pressure varies in different villages due to differences in agro-ecological environmental condition. These findings are in agreement with the results of Lal (1996).

The data related to the fruit damage percentage presented in Table 3, the tomato growing villages showed variable susceptibility to infestation of *Helicoverpa armigera* ranging from 23.28 to 47.35 per cent fruit damage. Average fruit damage of block Pusa were 35.09 per cent on tomato crop of farmers' field. The attack of *Helicoverpa armigera* larvae were maximum (47.35%) in village Narayanpur panchayat. Harpur followed by Bankurwa and Chandouli (Chandouli panchayat) the value ranging from 45.85 and 43.82 per cent, respectively. Our findings are akin with the results of Garg and Verma (1995), Reddy *et al.* (2000) and Singh *et al.* (2008).

Marketable fruit yield

Maximum marketable fruit yield of tomato (223.69 q/ha) and minimum yield loss (36.09%) was observed in Bankurwa village of panchayat - Chandouli and maximum yield loss (48.67%) and minimum yield (179.66 q/ha) was reported in village Jankinagar of Panchayat - Chakale Waini. Yield losses in different field due to *H. armigera* vary from 36.09 to 48.67 per cent. It is clear from yield data that farmers using locally available material and insecticides to control *H. armigera* were reported less yield loss and high yield per hectare (Table 3). These results are in accordance with the findings of Rehman and Mahbubar (1993) and Singh *et al.* (2008).

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FORMULATION OF CONVENTIONAL FOOD PRODUCTS USING *WATER CHESTNUT*

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ABSTRACT

Water chestnut suitably be incorporated in Halwa and Chestnut roll, were highly acceptable on the basis of sensory evaluation. In Halwa 80 percent water chestnut was highly acceptable and Chestnut roll 20 percent level of incorporation was highly acceptable in terms of Flavour and Taste, Colours, Texture, and Overall acceptability. The Maximum content of Calcium, Fiber and Iron were found in 80 percent level of incorporation and Energy, Carbohydrate, and Fat were decrease.

Keywords: fresh water chestnut, water chestnut flour.

The water chestnut is a tuber vegetable, or more accurately, the corn of the plant. These corns are a great source of fiber, vitamin B6 & other nutrients like potassium, calcium, iron, and riboflavin. They are great vegetable since they are low in fat. The corn of the water chestnut is whitish, small and round. It's somewhat hard, giving it a crisp texture that cans we eaten with or without cookingWater chestnut is valued for its nutritional and medicinal value used to treat illnesses from rabies to diarrhea. There are also other possible ways to exploit water chestnut including for paper pulp, fertilizer, fish food, compost, and biogas fuel. Drinking water chestnut juice slowly alleviates the problem.

They are supplied in fresh or powder form throughout the year for human consumption. Water chestnut is generally available October to January and production is more in winter. These vegetables do not have longer shelf life. Water Chestnut also content fair amount of calcium, potassium, iron, and zinc. This food is very low in saturated fat, cholesterol and sodium and a good source of dietary fiber, vitamin B6 and manganese.

MATERIALS AND METHODS

The experiments was conducted in the Research Laboratory of Dept. of Foods and Nutrition. Halina School of Home Science. Sam Higginbottom Institute of Agriculture Technology & Sciences (Deemed to be university) Allahabad.

1.**Procurement of raw materials:** Water chestnut fresh and powder and other raw materials were purchased from the local market of Allahabad.

2. **Experimental site:** The present investigation was carried out in laboratory of food and nutrition department of Halina School of Home science.

3. **Development of Products:** Two food products namely Halwa, Chestnut roll, were prepared by incorporating water chestnut at four different levels of incorporation. similar work done by Archana Tripath (2008), Gill B.S. et. al. (2006).

4. **Treatment and replication of products:** Th treatment and replication of the products are shov in the table below.

5. **Organoleptic analysis of cooking products** panel of five judges did sensory evaluation of two p ucts Halwa and water chestnut roll by using a s card based on the 9 point hedonic scale. Scores allocated for various parameters.

Method of calculation of nutritive value products: After sensory evaluation nutritive valu calculated using the food composition t

(Gopalan 2004)

Formula:

Nutrient /100g of product =

$$\frac{\text{Ingredient used (g)} \times \text{Nutritive value of Ingredient.}}{100}$$

Statistical analysis: Data as obtained from the experiment were statistically analyzed using analysis of variance technique and critical difference test.

RESULTS AND DISCUSSION

The data collected on different aspects as per plan were tabulated and analyzed statistically. The results obtained from the analysis are presented and discussed chapter in the following sequence.

The mean scores of Halwa in relation to colour, texture, Falvour and Taste and overall acceptability which indicates that treatment T4 (8.5) had the highest score followed by T3 (7.95), T2 (7.3), T1 (6.95), and T0 (6.55) making it quite obvious that the addition of 80 % fresh water chestnut did not in any way effect the Texture of Halwa. While an increase in the amount of fresh water chestnut increased the colour acceptability of Halwa.

The data shown that the adding of different level of Water chestnut on the colour, texture, overall acceptability of chestnut roll clearly indicates that treatment T1 (8.55) had the highest score for the colour of chestnut roll as compared to control T0 (8.35) and treatments T2 (7.9) ,T3 (7.7), T4 (7.5). The addition at 20% incorporation level of Water chestnut to chestnut roll improved the overall acceptability of the product. The table above shows that the maximum scores of taste and flavour was obtained by T1 (8.9)and T0 (8.15) followed by (7.85) respectively indicating that treatment T1 and T0 gave the best flavour to chestnut roll followed by T2,T3, while T4 was ranked the least favored by the panel of judges.

Table 1-Treatment and replication of the products

Treatment	Products and incorporation level of Water chestnut	
	Halwa	*Chestnut roll*
T_0	-	-
T_1	20%	20%
T_2	40%	40%
T_3	60%	60%
T_4	80%	80%
Replication		
Organoleptic test	4	4

Table 2. Average sensory scores of different parameters in control and treated sample of *Halwa* .

Treatments	Colour	Texture	Taste & Flavour	Overall acceptability
T_0	6.5±0.3	6.55±0.71	6.4±0.42	7.24±0.7
T_1	7.05±0.22	6.95±0.53	6.85±0.38	6.94±0.46
T_2	7.3±0.1	7.3±0.1	7.25±0.1	7.27±0.25
T_3	7.65±0.3	7.95±0.22	7.9±0.1	7.82±0.29
T_4	8.05±0.17	8.5±0.1	8.6±0.14	8.35±0.29

Table 3. Effect of incorporation of Water chestnut in control and treated sample of *Chestnut roll*.

Treatments	Colour	Texture	Taste & Flavour	Overall acceptability
T_0	8.35±0.3	8.1±0.1	8.15±0.1	8.19±0.3
T_1	8.55±0.22	8.75±0.17	8.9±0.1	8.72±0.22
T_2	7.9±0.1	7.95±0.38	7.85±0.3	7.89±0.1
T_3	7.7±0.3	7.7±0.17	7.85±0.3	7.74±0.3
T_4	7.5±0.17	7.8±1.23	7.85±0.3	7.71±0.17

NUTRITIONAL COMPOSITION OF THE PRODUCTS

Table 1. Average percentage of nutrients in control and treated sample of *Halwa*.

Treatment Nutrient	T_0(Control)	T_1 (20%)	T_2 (40%)	T_3 (60%)	T_4 (80%)
Fat (g)	14.31	14.17	14.03	13.89	13.75
Fibre (g)	2.27	2.14	2.01	1.88	1.75
Carbohydrate (g)	63.23	58.62	54.01	47.07	44.79
Energy (Kcal)	582	559	537	514	492
Calcium (mg)	107	104.2	101.4	98.6	95.8
Iron (mg)	4.04	3.685	3.33	2.975	2.62

Table 2. Average percentage of nutrients in control and treated sample of *Chestnut roll*.

Treatment Nutrient	T_0(Control)	T_1(20%)	T_2(40%)	T_3(60%)	T_4(80%)
Fat (g)	52.06	55.09	51.15	51.17	51.19
Fibre (g)	1.52	1.64	1.56	1.58	1.6
Carbohydrate (g)	89.27	89.34	89.41	89.48	89.55
Energy (Kcal)	869	871	872	874	876
Calcium (mg)	66.58	67.58	68.58	69.58	70.58
Iron (mg)	3.802	3.889	3.976	4.063	4.15

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EVALUATION OF WHEAT BRAN, SOYABEAN FLOUR AND WHEAT STRAW SINGLY AND IN COMBINATION FOR THE PRODUCTION OF OYSTER MUSHROOM

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ABSTRACT

Present study deals with the evaluation of different supplements and wheat straw for the production of oyster mushroom (*Pleurotus sajor caju*) (Fr.) Sing. For the purpose, one substrate, viz. wheat straw and different supplements viz. wheat bran, soyabean flour singly and in combination were used. All the supplements were found effective for the production of oyster mushroom. However, maximum yield (572.00 gram) was recorded when wheat straw was supplemented with combination of wheat bran+soyabean flour followed by soyabean flour (548.00 gram) and wheat bran (513.00 gram) respectively.

Key Words: *Pleurotus sajor caju*, substrate, amendment, yield.

Mushrooms, the edible fleshy fungi, though utilized as food since time immemorial. Mushrooms are good quality protein and are rich in vitamins and minerals. Mushrooms contain 35-47% protein (dry weight basis) which is higher than in vegetables and fruits and is of superior quality, mushrooms are rich of lysine and tryptophan and to essential amino acids that are deficient in cereals. They contain good amount of vitamin C and B complex (thymine, riboflaviun and niasin), potassium, phasphorus and sodium, also low but available form of iron. They are a low caloric food with very little fat and sugars and without starch and cholesterol. Mushrooms are grown on waste organic substrates released from farms, plantations or factories. Pasteurized wheat straw is most suitable substrate for cultivation of oyster mushroom and support its maximum production. Supplementation of mother substrate with various substances of organic and inorganic nature, prior to spawning for enhancement of yield of this mushroom species has been widely used. Keeping this view in mind, the present study was undertaken for maximum production of oyster mushroom.

MATERIALS AND METHODS

This experiment was conducted in National Academy of Biological Sciences and Rural Development, Jhunsi, Allahabad (A research wing of Society of Biological Sciences and Rural Development). Wheat straw were dried and cut into 3-4 cm. long pieces and were soaked 10-12 hours in fresh water. To avoid the any type of infection bavistin 7.0 gram and formlaene (40%) 125ml/100 liter were added. Wheat straw than taken out from water and were spread over cemented floor to drain out excess water.

The supplements, wheat bran and soyabean flour were treated in autoclave at 15 lbs psi for 20 minutes. The polythene bags (of size 35x50cm) of 100 gauge thicknesses were filled with wheat straw and supplements were added @ 2% dry weight basis in 4 layers. After each layer spawning was done with the grain spawn @ 2% bag containing 1 kg. dry substrate. All the treatments were replicated three times. These spawned bags were kept in cropping room where the temperature ranged 20-25°C along with 60-65% relative humidity. After 15 days of spawning, the bags were completely colonized by mushroom mycelium and polythyne were removed. The first flush o sporophores were harvested after 25th days o

Table-1: Evaluation of wheat bran, soyabean flour and combination of wheat bran + soyabean flour on the fruiting body and yield of mushroom.

T_1 Wheat straw + Wheat bran - 1kg+20gram.
T_2 Wheat straw + Soyabean flour - 1kg+20gram.
T_3 Wheat straw + wheat bran+ Soyabean flour - 1kg+20gram.
T_0 Wheat straw (control) - 1kg

S.No.	Treatment	Fruiting body	Yield
1.	T_1	110.00	513.33
2.	T_2	130.00	548.33
3.	T_3	137.00	572.00
4.	T_0	65.00	326.00
5.	CD at 5%	8.535	40.956
6.	Result	S	S

spawning. The second and third flushes were harvested on 32nd and 40th days of spawning respectively. The yield of fruiting bodies on fresh weight basis was recorded.

RESULTS AND DISCUSSION

The maximum number of fruiting bodies (137.00) were found on combination of wheat bran + soyabean flour followed by soyabean flour (130.00) and on wheat bran (110.00). The maximum production of yield (572.00 gram) were also recorded in combination of wheat bran +soyabean flour followed by soybean flour (548.00 gram) and wheat bran (513.00 gram) respectively. Maximum production were noted in combination of wheat bran + soyabean flour due to additional supply of nutrients and energy from the wheat bran and soyabean flour which encourage healthier growth of mycelium for the development of fruiting body of mushroom. Similar observation made by Bano (1971), Jandaik (1974), Pant and Pandey (2008, 2011, 2012), Schisler and Sinden (1963), Pathak et.al. (1995).

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QUALITY PERAMETTERS OF ICE LOLLY PREPARED BY THE INCORPORATION OF FRUIT JUICE

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ABSTRACT

Results obtained from the statistical analysis revealed that fruit juice can be satisfactorily mixed with orange juice, pineapple juice, and water to prepare fruit juice ice lolly. It is further concluded that fruit juice ice lolly 80 percent (T2 Treatment) and 90 percent (T3 Treatment) is most acceptable. In terms of flavour and taste and body and texture 80 percent (T2 Treatment) is best treatment. In terms of colour and appearance and over all acceptability 80 percent (T2 Treatment) is best treatment. The nutritional composition of fruit juice ice lolly, In terms of Total carotene and Vitamin C 90 percent (T3 Treatment) is best treatment.

Keywords: orange juice, pineapple juice, sugar, citric acid.

Fruit juices are nutritious beverages that have been enjoyed by adults and children decades. Juices can play a important role in a healthy diet because they often great taste and a variety of nutrients found naturally in fruits. These juices are fat free nutrients dense beverage that are rich in vitamins, minerals and naturally occurring phytonutrients that contributes to good health. "Ice lollies or edible ices" mean the frozen ice produce which may contain sugar, syrup, fruit, juices, cocoa, citric acid permitted flavours and colours. It may also contain permitted stabilizers and/ or emulsifiers not exceeding 0.5 percent by weight. It shall not contain any artificial sweetener.

Fruit juice is very good for health. Therefore enhancing the nutritive value and flavor, the fruit juice is incorporated in its by which vitamin C and minerals will increase in approximate amount as fruit juice are nutritional heroes, they store a gold mine of nutrients. Orange, Pineapple is the second most popular tropical fruits. It has more nutritious value to compare to other fruits. Fruits are generally available in winter seasons.

MATERIALS AND METHODS

The experimental work was carried out in the researcl laboratory of the Warner School of Food & Dair Technology and Halina School of Home Scienc SHIATS Allahabad. The different materials used i the experiments.

1. COLLECTION OF INGREDIENTS:- Fr juices, sugar was purchased from local market Allahabad. Stabilizer, flavour, colour was obtain from Student's Training Dairy and Home Scie Department, Allahabad, SHIATS Allahabad.

2. PREPRATION OF ICE LOLLY:- Fruit ju was blended in the mixer grinder with the additio sugar and water to make Fruit juices.

3.ORGANOLAPTIC EVALUATION OF FR JUICE ICE LOLLY:-
A panel of five judges did sensory evaluation o juice ice lolly by using a score card based or point hedonic scale. Scores were allocated for v parameters.

4. NUTRITIONAL ANALYSIS:-

Details of Treatments:-

Treatments	
T_1	Ice lolly by using 75 percent fruit juice.(orange juice 50 percent + 25 percent pineapple juice).
T_2	Ice lolly by using 80 percent fruit juice.(orange juice 60 percent + 20 percent pineapple juice).
T_3	Ice lolly by using 90 percent fruit juice.(orange juice 80 percent + 10 percent pineapple juice).

- Determination of vitamin C percentage by the AOAC (1980) Association of Analytical chemist.
- Determination of total carotene percentage by the AOAC (1980), Association of Analytical chemist.

5. STATISTICAL ANALYSIS:-

The data obtained for various parameters were analyzed statistically using Analysis of variance ANOVA (Two way classifications) and critical difference techniques.

RESULTS AND DISCUSSION

The data collected on different aspects as per plan were tabulated and analyzed statistically. The results obtained from the analysis are presented and discussed chapter in the following sequence.

ORGANOLEPTIC PROPERTIES

Flavour and Taste
Body and Texture
Colour and appearance
Overall acceptability

Significant difference ($P \leq 0.05$) in colour and earance was found amongst the treatment. Sample had the highest scores of colour and appearance 3.76 followed by Treatment T3 (8.7) and tment T1 (8.4). There was significant difference in the colour and appearance between (T1,T3) and (T2,T3)treatment combinations, while there is no significant difference among rest of the treatment combinations.

Highest scores of body and texture of 8.63 was recorded in Treatment T3. This was followed by Treatment T1 (8.6) and Treatment T3 (8.53). There was no significant difference in body and texture scores of the treatment combinations.

Highest scores of flavour and taste of 8.26 was recorded in Treatment T2. This was followed by Treatment T3 (7.03) and Treatment T1 (6.73). There was no significant difference in flavour and taste scores of the treatment combinations.

Significant difference ($P \leq 0.05$) in overall acceptability was found amongst the treatment. Sample Treatment T2 had the highest overall acceptability of 8.76 followed by Treatment T3 (8.7) and Treatment T1 (8.4). There was significant difference in the overall acceptability between (T1,T2) and (T2,T3) treatment combinations, while there is no significant difference among rest of the treatment combinations. Similar Observations made by *Babu and Gupta (2005), Suman and Kumari (2002), Herlambang (2007).*

NUTRITIONAL PROPERTIES

* Percentage vitamin C in Fruit juice ice lolly.
* Total carotene content in fruit juice ice lolly.

FLOW CHART FOR FRUIT JUICES ICE LOLLY

Receiving of Water

↓

Addition 75 % Fruit juices (Oranges and Pineapple juices) | Addition of 80 % Fruit juices (Oranges and Pineapple juices) | Addition of 90 % Fruit juices (Oranges and Pineapple juices)

↓

Preheating 62^0 to 65^0

↓

Addition of Sugar and Stabilizer (sugar 22 % and stabilizer 0.3)

↓

Filtration

↓

Heating and Holding (85 0C for 5 min.)

↓

Cooling

↓

Addition of colour and Flavor

↓

Filling in Mould

↓

Freezing (-10 to -15 0C) using Brine solution

↓

Storage

SENSORY SCORES

Table 1 Average Value of Fruit Juice ice lolly incorporated with fruit juice at different levels.

Parameters / Treatments	Color and Apperence	Body and Texture	Flavor and Taste	Overall Acceptability
T_1	8.4	8.6	6.83	7.97
T_2	8.76	8.63	8.26	8.78
T_3	8.7	8.53	7.03	8.11

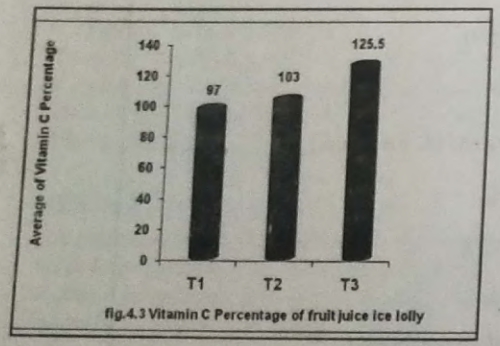

fig.4.3 Vitamin C Percentage of fruit juice ice lolly

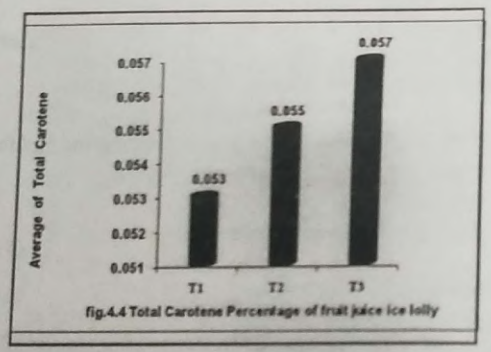

fig.4.4 Total Carotene Percentage of fruit juice ice lolly

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BIOCONCENTRATION OF HEAVY METALS IN SOME LEAFY VEGETABLE CROPS GROWN IN SEWAGE IRRIGATED AREAS OF ALLAHABAD, INDIA

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ABSTRACT

The problem of soil pollution through sewage irrigation raises serious concerns because the heavy metals present in effluents accumulated in the plant root only affect the growth and quality of crops but also their threaten the health of consumers. The study has been conducted to find out the bioconcentration of heavy metals (Cr, Cu, Pb and Zn) on three vegetable crops viz. spinach, fenugreek and lettuce grown in sewage irrigated soil at S.D.I. Farm and K.A.D.C. Farm. Similar vegetable samples from another irrigated fields at Hathigava cultivated areas (the main source of green vegetable in Allahabad city) used as control. Samples were collected during dry and rainy seasons. Samples from K.A.D.C. Farm indicated highest mean levels of Zn (11.87±0.61 $mgkg^{-1}$) and Pb (1.12±0.04 $mgkg^{-1}$) while those from S.D.I Farm indicated highest levels of Cu (2.96±0.57 $mgkg^{-1}$) and Cr (1.17±0.04 $mgkg^{-1}$).Comparison of results with the control showed significant levels ($p<0.05$) of all the metals analysed in the vegetable samples obtained from the sewage irrigated area. However, the levels were within the Indian Standard (IS) tolerable limits for metals in fresh leafy vegetables.

Key words: Sewage irrigation, leafy vegetable, bioconcentration, pollution

As human activities increases, especially with the application of modern technologies, Pollution and contamination of the human food chain has become inevitable. Heavy metals uptake by plants grown in polluted soils has been studied to a considerable extent (Wong, 1996; Wong et al., 1996 Sukreeyapogse et al.,2002; Yusuf et al.,2003).Utilization of heavy metal accumulating plants in reclamation of contaminated soil with heavy metals and assessment of heavy metal mobility in terrestrial ecosystem particularly trophic level of higher plants have been studied by several researchers Leita et al.1991, Prince et al.2001, and Nivethitha et al. 2002). Heavy metal contamination in vegetables cannot be underestimated as these food stuffs are important components of human diet. Heavy metals contamination of the food items is one of the most important aspects of food quality assurance (Marshall, 2004; Radwan and Salama, 2006; Wang et al., 2005; Khan et al.,2008).International and national regulations on food quality have lowered th maximum permissible levels of toxic metals in foo items due to an increased awareness of the risk, thes metals pose to the food chain contamination (Radwa and Salama, 2006).Long term waste water irrigatic may lead to the accumulation of heavy metals agricultural soils and plants. Food safety issues a potential health risks make this as one of the m serious environmental concerns (Cui et al. 200 Vegetables accumulate heavy metals in their edible non edible parts. Although some of the heavy me such as Zn, Mn, Ni and Cu act as micro-nutrien lower concentrations, they become toxic at hi concentrations. Health risk due to heavy m contamination of soil has been widely rep (Eriyamremu et al.2005; Muchuweti et al. Satarug et al. 2000).Crops and vegetables gr soils contaminated with heavy metals have accumulation of heavy metals then those gr uncontaminated soil (Marshall et al2007; Sh

al.2006). While sewage provides water and valuable plant nutrients, if leads to the potential accumulation of heavy metals in agricultural soils (abdel-Sabour 2003; Zhang et al. 2008). When the contents of heavy metals exceed the permitted threshold they will impact the normal growth of crops or even might enter food chain to threat human and animal health (Akoumianakis et al. 2009; Fu et al.2009; Salvatore et al.2009; Khan et al. 2008) observed a substantial build-up of heavy metals in plants grown in wastewater irrigation soils of Beijing , in which the heavy metals concentration were significantly higher than those in the reference soil and exceeded the permissible limits set by SFPA in China and WHO. The toxicity and mobility of heavy metals in soils depend not only on the total concentration, but also on their specific chemical form and soil properties like pH, organic matter content etc. (Lu et al. 2003).However, scantly literature is mobility of heavy metals from soil to different vegetable crop plant components. Therefore, the present study was undertaken to visualize the trend of heavy metals in vegetable crop plants and their mobility in various vegetable crop grown in sewage irrigated sites of Allahabad, India.

STUDY AREA

Kulbhaskar Ashram Degree College Farm (KADC) and Sheila Dhar Institute Farm (SDI) are sewage irrigated sites alongside in sewage water in Allahabad city, while Hathigava Cultivated area (HCA) has vegetable growing fresh water to irrigated with Canal and Tube well water.

The objectives of this study were to analyze the vegetable samples from the irrigation sites for heavy metals and to compare results obtained with one another and with those of Indian Standard (Awashthi 2000) safe limits, while using vegetable (spinach, fenugreek, and lettuce) samples from Canal and Tube well water as control. The metals of interest include Chromium (Cr), Lead (Pb), Copper (Cu) and Zinc (Zn). The results obtained from this study will be useful assessing the metals contamination and as well as determining the need for remediation. The results would also provide information for background levels metals in the vegetables in the study area.

MATERIALS AND METHODS

Analytical reagent grade chemicals and distilled water were used throughout the study. All glassware and plastic containers used in this work were washed with detergent solution followed by 20% (v/v) nitric acid and then rinsed with tap water and finally with distilled water.

SAMPLING AND SAMPLE TREATMENT

The vegetable analyzed include spinach, fenugreek and lettuce. Samples were collected twice in the year 2010 from three different area in each site. The first round of sampling was carried out in May towards the end of the dry season while the second round was in September at the good time of rainy season. Each sample was randomly handpicked and collects in a big brown envelope and labeled.

In the laboratory, each sample was washed with tap water and thereafter with distilled water and then dried in oven at 80°c (Larry and Morgan, 1986). At the end of drying, the oven was turned off and left overnight to to enable the sample cool to room temperature .Each sample was ground into a fine powder ,sieved and finally stored in a 250 cm^3 screw capped plastic jar appropriately labeled.

DIGESTION PROCEDURE

A 2.0 g of the sample was weighted out into a Kjeldahl flaks mixed with 20.0 ml digested in tri-acid mixture (750 ml. conc. HNO_3, 150 ml conc. H_2SO_4 and 300 ml $HClO_4$) by volume respectively and left to stand overnight .Thereafter, the flask was heated at 70° C for about 40 min and then, the heat was increased to 120°C.The mixture black after a while (Erwin and Ivo1992).The digestion was complete when the solution became clear and white fumes appeared. The digest was dilute with 20 ml of distilled water and boiled for 15 min. This was then allowed to cool, transferred into 100 cm^3 volumetric flasks and diluted to the mark with distilled water. The sample solution was then filtered through a filter paper into a screw capped on bottle.

INSTRUMENTAL ANALYSIS

An heavy metals was determined by Induced Coupled Plasma Model- LABTEM. Working standards were also prepared by future dilution of

1000 ppm stock solution of each of the metals and a calibration curve was constructed by plotting absorbance versus concentration.

STATISTICAL ANALYSIS

All analysis was performed in triplicates. Result were expressed by means of ±SD. Statistical significance was established using one way analysis of variance (ANOVA).

RESULTS AND DISCUSSION

The mean concentration of Cu, Zn, Pb and Cr in different vegetable sample from the two effluent irrigated sites and control are listed in Table 1A and B.

The mean concentration of Cr, Pb , Cu and Zn in different vegetable samples from the two sewage irrigated sites and control are listed in Table 1A and B. The result generally show significant levels ($p<0.05$) of metals in vegetable samples obtained from the effluent sewage irrigated areas (SDI and KADC) compared with those obtained from the control (Hathigava Cultivated Areas) area. The high concentration of heavy metals observed in the vegetable samples from the sewage irrigated area might be related sample to the concentrations of the metals in the soil. (Al Jassir et al., 2005; Akinola and Ekiyoyo, 2006). Also from the result, general reductions in metal levels were observed in vegetables sampled during the rainy season when compared with those sampled during dry season.

This may be due to the fact that during the rainy season, the areas were not irrigated with the wastewater. There is also the possibility of rainwater leaching away parts of the metals that have accumulated in the soil, thus reducing the quantity of these metals available to plants in the soil. However, there are a few cases in the control site where negative values were recorded for percentage loss of metal in rainy season samples over those of the dry season, thus indicating an increase in metals levels in the rainy season samples over those of the dry season^{-1} (Table 2).This may be attributed to the possibility of the runoffs from the surrounding

Table1A.Average levels of heavy metals mgkg^{-1} in vegetable in the dry season.

Sampling site	Metals			
	Cr	Pb	Cu	Zn
		Spinach		
KAD	0.99±0.14	1.12±0.04	2.29±0.208	11.87±0.61
SDI	1.17±0.04	1.07±0.16	2.96±0.570	10.50±0.70
HCA	0.18±.025	B.L.D	0.28±0.020	1.53±0.07
		Fenugreek		
KAD	0.68±0.35	1.07±0.041	2.4±0.20	8.20±0.40
SDI	0.90±0.52	1.00±0.14	1.61±0.31	9.27±0.94
HCA	0.16±0.02	B.L.D	0.25±0.03	1.37±0.05
		Lettuce		
KAD	0.62±0.02	0.967±0.122	2.11±0.28	7.43±0.568
SDI	0.85±0.035	0.89±0.064	2.8±0.4	8.90±0.61
HCA	0.13±0.04	B.L.D	0.22±0.02	1.30±0.02

Values are mean ±SD of three sample of each vegetable, analyzed individually in triplicate. B.D.L : detection limit.

Table 1B: Average levels of heavy metals mgkg^{-1} in vegetables in the rainy season.

Sampling site	Metals			
	Cr	Pb	Cu	Zn
		Spinach		
KAD	0.57±0.03	0.84±0.03	1.9±0.10	8.7±0.30
SDI	0.62±0.02	0.93±0.03	2.3±0.264	9.2±0.529
HCA	0.18±0.02	B.D.L	0.22±0.015	1.42±0.02
		Fenugreek		
SDI	0.55±0.041	0.90±0.88	1.85±0.04	8.27±0.305
KAD	0.54±0.02	0.80±0.01	0.81±0.01	0.18±0.01
HCA	0.18±0.015	B.D.L	0.20±0.005	1.39±0.01
		Lettuce		
SDI	0.54±0.02	0.89±0.03	2.17±0.15	8.06±0.03
KAD	0.52±0.02	0.78±0.01	1.70±0.1	7.6±0.2
HCA	0.19±0.01	B.D.L	0.21±0.01	1.35±0.03

Values are mean ±SD of three samples of each vegetable, analyzed individually in triplicate. B.D.L : Below detection limit.

land containing metals salts being washed into the control site. Generally, the mean concentration range of Cu in all vegetable analyzed was 0.22 to 2.97 mgkg^{-1}, with the highest concentration recorded for KADC Farm spinach and lowest for lettuce from the control site. The maximum value recorded is below the Indian Standard (Awashthi, 2000) maximum tolerable Cu concentration of 42 mgkg^{-1} in fresh vegetable (Figure 1). Cr was below detectable level in control samples while the highest level of 1.17 mgkg^{-1} was obtained in SDI spinach. Also Pb was below the detectable level in control samples while KAD spinach recorded the highest level of 1.12 mgkg^{-1}. The highest value obtained for Pb and Cr are below the I.S safe limits for these metal (2.5 and 20 mgkg^{-1}, respectivelly) in fresh vegetables. The results indicate the mean concentration range of Zn found to be 1.30 to 11.87mgkg^{-1} with the highest concentration found in KADC Farm spinach and the lowest in lettuce from control site. However, the highest value obtained is still below the I.S safe limit of Zn (50 mgkg^{-1}) in fresh vegetables. The results obtained in the study are comparable with some literature values of similar studies reported previously (Onianwa et al., 2001; Erwin and Ivo, 1992; Pennington et al., 1995). Consequently, from the results, the general trend for the mean levels of metals analyzed in all vegetables sampled from the two sewage irrigated site as well as the control for both dry and rainy season showed that for the concentrations of Pb and Zn, KADC>SDI>Control; for Cr and Cu concentration, KADC>SDI>control (Figure 1). These sequence indicated that the metal contents of the vegetables were higher in areas being treated with sewage irrigated area. The observation is in good agreement with other studies elsewhere (Sharma et al., 2006; Sawidis et al., 2001) which suggested that uptake of metals by plants is proportional of their concentrations and availabilities

Table 2: Percentage loss of heavy metals in vegetables in rainy season compared with in dry season.

Metals	KAD	SDI	HCA	Control Mean±%loss
		Vegetable		
		Spinach		
Cr	42.42	52.99	22.22	39.21±15.63
Pb	25.00	13.00	B.D.L	12.67±12.50
Cu	17.00	22.29	21.42	20.2±2.83
Zn	22.49	17.14	7.1	15.6±7.81
		Fenugreek		
Cr	19.11	40.00	-12.5	15.50±26.42
Pb	15.88	20.00	B.D.L	11.96±10.56
Cu	22.91	49.68	1.21	30.86±16.36
Zn	0.75	1.21	1.46	1.14±0.36
		Lettuce		
Cr	12.90	38.82	0 .77	17.5±19.43
Pb	8.24	12.35	B.D.L	6.86±6.28
Cu	2.76	39.28	4.5	16.09±20.08
Zn	9.4	2.3	3.7	5.11±3.78

Furthermore, the relative high levels of Zn, Cu, Cr and Pb in SDI and KAD may be attributed to the contaminated soil.

in soils. The trend also shows that KAD sewage irrigated site recorded highest mean concentration in three metals analyzed (Pb, Cu and Zn), while SDI sewage irrigated highest concentration in metals Cr. Hence, the trend for the level of contamination by metals in the irrigation areas is KAD>SDI>Control (Figure 1).

The study further confirms the increased danger of growing vegetables on soils sewage irrigated with contaminated domestic wastewaters. However, the levels of the metals are currently within the Indian Standards safe limits guidelines. But, if the practice of treating the soils in the irrigation soil with contaminated waters is not controlled, it may lead to health haza on the part of consumers of the vegetables on the lo term. Therefore, there is the need to continua monitor, control and take necessary policy decisi so as to limit and ultimately prevent these avoida problems. Irrigation of agricultural lands by waste and sewage sludge for several years increased he metals in soils and plant. The concentration of h metals increased significantly in the soil and p compared to control. Control of wastewate sewage-sludge pollution with heavy metal is the of great concern. Thus, it is essential to the stu pollution source of wastewater. The result of thi

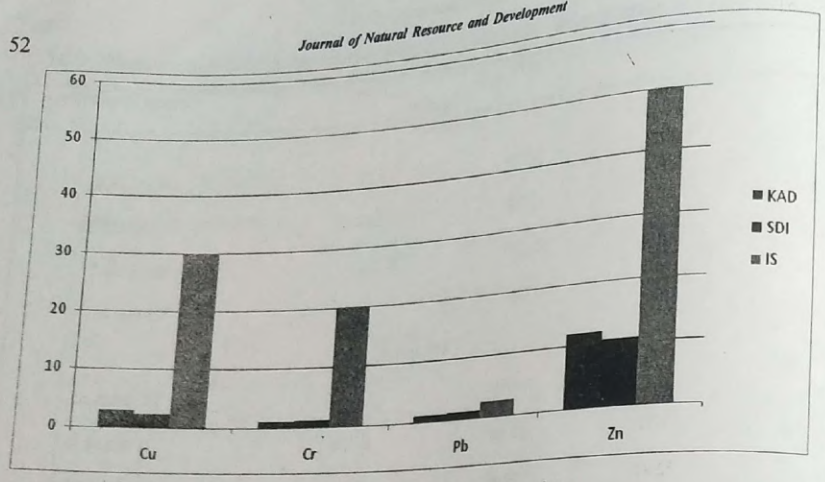

Fig. 1. Variation of total mean levels of metals in relation to the sewage sites.

can be used for management for wastewater and sewage sludge application in agricultural lands and crop production. The sewage irrigated vegetable and other products would face a difficult time in the consumer markets if the present practice of using sewage water continues .Therefore, it is need of time to focus such issues.

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BRIDGING THE YIELD GAP IN PADDY CULTIVATION IN INDIA

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ABSTRACT

It is concluded from the study that there is no scope for area expansion under paddy cultivation in India. The yield of 60 percent area was less than 2.5 tones/ ha under paddy cultivation. It is suggested that to bridge gap in paddy, there is need of district level information on seed replacement ratio of the paddy crop. If district with low seed replacement ratio and lower yield need special attention for yield improvement by adoption of the improved varieties and it will be economical and suitable policy option to bridge the yield gap in these crops. If seed replacement ratio is at desired level (25% for self pollinated crops and 35% for cross pollinated crops) emphasis should given to identify the other constraints and judicious measures use to remove on the basis of severity of the constraints. The prioritization of extension and research agenda and suitable policy measures to sustain the productivity and break the yield barrier thorough improvement in genetic potential and other technological options should used in holistic manner for rice wheat and pulses.

Key Words: *Paddy, cultivation, yeild.*

Paddy occupies an important place in Indian agriculture, as it provides the staple food for two-thirds of the population, providing over 40 percent of calorie requirement. Paddy occupies over 23 percent of gross cropped area (43.79 million ha during TE 2009-10) which is largest in the world among the rice growing countries. However, in terms of average yield, the position is far below (2.3t/ha) in comparison to China (6.6 t/ha), Vietnam (5.2 t/ha), Indonesia (5.0 t/ha) and even Bangladesh (4.2 t/ha) among Asian countries. In continuation to the total production of paddy was 103 million tonnes and yield was 2.3 t/ha during 2011-12 (third advance estimate) in India. While the total domestic demand for rice to be 113.3 million tonnes and it requires 28-29 % yield enhancement to achieve 2.65t/ha average yield for paddy for the year 2021-22 (Kumar, et al., 2009). Therefore, Government of India launched, 'National Food Security Mission (2007)' to increase the production of 10 million tonnes of rice, 8 million tonnes of wheat and 2 million tonnes of pulses by the end of Eleventh Plan (2007-08 to 2011-12) through bridge the yield gap by using dissemination of improved technologies and farm management practices in those districts which have high potential but relatively low level of productivity performance at present (GoI, 2007).

The yield gap analysis is a useful guide in establishing research priorities for rice, wheat and pulse crops through knowledge of yield limiting factors and their influence on yield (Singh, 2001).The availability of good quality seeds is major yield limiting factor and seed replacement rate has a strong positive correlation to enhance the yield of the crop. Therefore, availability of good quality seeds suitable for various agro-climatic conditions and sufficient quantity at affordable prices are appropriate policy options to bridge the yield gap in paddy in India.

MATERIALS AND METHODS

The yield gap is the difference between yield obtained at the nearest demonstration plot and average yield obtained at farmers' field in a particular

region. The study is based on secondary data, which were collected from various publications from Directorate of Rice Development, Patna, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India and Directorate of Rice Research, Hyderabad.

RESULTS AND DISCUSSION

Yield Gap and Seed Replacement rate of Rice

The status of yield gap and rate of seed replacement in major paddy growing states is depicted in Table 1. It reveals that there is substantial yield gap ranging from 4% to over 60% between improved and check variety at farmers' field. The maximum yield gap was reported in the state of Jharkhand followed by Assam and Uttar Pradesh. Moreover, there was huge yield advantage of improved variety over the state average yield ranging from over 80% in West Bengal to 500% in Jharkhand. The seed replacement ratio varied among the states and positively correlated with the state average yield. It is observed that the seed replacement ratio is lower than national average (25%) in most of the states except Andhra Pradesh, Tamil Nadu and Karnataka. It implies that yield gap would be reduced by enhancing seed replacement rate and use of improved variety appropriate for the particular state.

District-wise Productivity of Rice

The categorization of the districts on the basis of productivity of paddy in major growing states is presented in Table 2. It reveals that only 20% of the districts belongs to high productivity category (> 2.5t/ha) and all the districts of the Punjab fall under this category. However, none of the districts from the state

ble1. Yield gap in major paddy growing states of India, 2007-08

(Yield t/ha)

	Ecosystem	Yield of improved variety	Yield of check variety	% Yield gap between improved and check variety	State average yield	% Yield advantage of improved variety over state average yield	% Seed replacement rate in year 2006
engal	Irrigated	4.1	4.0	4	2.3	83	26
adesh	Irrigated	7.8	5.9	33	2.2	259	21
garh	Shallow lowlands	3.9	3.4	14	1.1	256	9
radesh	Upland	5.6	4.9	15	2.7	110	76
	Shallow lowlands	5.0	4.1	13	1.5	227	12
	Shallow lowlands	4.6	3.2	41	1.5	211	11
	Irrigated	7.1	5.6	27	3.3	116	56
	Upland	3.8	3.3	13	1.7	124	24
	Upland	6.1	3.7	66	1.0	498	12
	Irrigated	5.8	4.9	18	2.5	137	34
	Irrigated	4.5	4.2	7	1.5	204	22

e Demonstrations on Rice (2007-08), Directorate of Rice Research, Rajendranagar, Hyderabad
Statistics at a Glance, 2009, Directorate of Economics and Statistics, Ministry of Agriculture, ndia.

of Orissa, Chhattisgarh, Assam, Madhya Pradesh, Jharkhand and Gujarat reached under this category. The share of Medium productivity districts (2.0-2.5t/ha), Medium-low productivity districts (1.5-2.0 t/ha), Low productivity districts (1.0-1.5t/ha) and Very low productivity districts (< 1.0t/ha) were estimated as 18%, 21%, 25% and 15% respectively at all India level. The productivity of more than 60% of the districts were less than national average (< 2.0t/ha). It implies that there are ample scope to enhance productivity over 60% of the districts by removing the yield limiting factors through adoption of new technologies and judicious use of natural resources especially land and water appropriate for various agro-ecological situations in India.

Farmers' Perceptions and Factors Affecting Low Yield

The farmers' perceptions of constraints responsible for yield gap in major paddy growing states are presented in Table 3. It shows that soil needs amendments, followed by lack of drainage facility, resistant varieties and lack of credit facilities were major constraints in state of Andhra Pradesh. In state of Assam poor irrigation facility, followed by lack of credit facilities, disease and other pest infestation and lack of drainage facilities were reported major constraints. Lack of credit facilities ranked first followed by inadequate fertilizer application, non-availability of hybrid seed, inadequate availability of good varieties and lack of technical support were reported major

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Table2. Categorization of the districts on the basis of productivity of paddy in major growing states in India during 2002-07

State	High productivity districts (> 2.5t/ha)	Medium productivity districts (2.0-2.5t/ha)	Medium-low productivity districts (1.5-2.0 t/ha)	Low productivity districts (1.0-1.5t/ha)	Very low productivity districts (< 1.0t/ha)	Productivity below the national average (< 2.0t/ha)
West Bengal	8	7	3	0	03	03
Uttar Pradesh	5	31	25	6	3	35
Orissa	0	0	8	20	2	30
Chhattisgarh	0	0	4	12	0	16
Andhra Pradesh	14	6	2	0	0	2
Bihar	1	2	7	18	10	35
Punjab	19	0	0	0	0	0
Assam	0	1	11	12	2	25
Tamil Nadu	25	2	2	0	0	2
Madhya Pradesh	0	2	2	6	34	42
Maharashtra	1	5	1	10	15	26
Jharkhand	0	3	11	7	1	19
Karnataka	11	11	1	2	2	5
Haryana	12	4	3	0	0	3
Gujarat	0	5	6	2	3	11
Kerala	1	10	2	1	0	3
All India	115	103	119	143	83	346

Source: Directorate of Rice Development, Patna, Ministry of Agriculture, Government of India.

constraints in state of Bihar. In the state of Chhattisgarh, Inadequate availability of good varieties followed by varieties available but susceptible to diseases and inadequate fertilizer application was reported as major constraints. The half of the respondents reported that disease and other pest infestation were main constraint in rice production in state of Haryana. The respondents of Orissa state reported almost all the constraints among them needs of soil amendment ranked first, followed by lack of technical support and inadequate fertilizer application. The inappropriate and inadequate fertilizer application and inadequate availability of good varieties were major constraints in state of Uttar Pradesh. The disease and other pest infestation, inadequate availability of good varieties and lack of resistant varieties were major constraints identified in state of West Bengal. The halves of the respondents were reported that inadequate availability of good varieties, inadequate fertilizer application and disease/ pest infestation were major constraints in rice production in state of Tamil Nadu (Table 3).

Farmers' Perceptions and Factors Affecting Yield Constraints

Farmers' perceptions for constraints responsible for yield gap in paddy among all major growing states are ranked in Table 4. The lack of credit facilities ranked first followed by inadequate availability of good varieties, inadequate fertilizer application, availability of resistant varieties, and disease/pest infestation were identified as major constraints in all major rice growing states. It implies that first priority for removal of constraints would give to solve the problem of credit, followed by other constraints their rank accordingly.

Table 3. Farmers' perceptions of constraints responsible for yield gap in major paddy growing states in India, 2003-04.

Constraints	State									
	Andhra Pradesh	Assam	Bihar	Chhattisgarh	Haryana	Orissa	Uttar Pradesh	West Bengal	Tamil Nadu	All states
Inadequate availability of good varieties	20	1	88	81	0	18	54	91	50	47
Varieties available but susceptible to disease	78	0	8	63	0	14	2	80	0	39
Non-availability of hybrid seed	53	3	92	50	0	14	11	39	0	32
Fertilizers of required formulation not available	3	0	67	6	0	14	0	0	0	7
Fertilizer application inappropriate	6	0	88	13	0	23	81	5	25	23
Fertilizer application inadequate	67	3	92	56	0	41	65	10	50	40
Land requires leveling	11	1	0	0	0	18	2	0	0	3
Soil needs amendment	98	10	0	13	0	91	4	37	0	35
Lack of drainage facility	89	14	0	0	0	23	14	39	0	31
Poor irrigation facility	2	44	0	19	0	18	5	3	0	12
Lack of technical support	3	0	79	13	0	68	0	0	0	12
Disease/ pest infestation	2	23	8	44	50	18	4	95	50	37
Lack of credit facilities	73	43	92	0	0	18	4	76	25	48
Others	3	64	4	13	50	9	14	0	0	20

Note: The sum of constraints in a particular state not necessary equal to 100.
Source: Frontline Demonstrations on Rice (2003-04), Directorate of Rice Research, Indian Council of Agricultural Research, Rajendranagar, Hyderabad.

Table 4. Ranking of farmer's perception for constraints responsible to yield gap in paddy in India, 2003-04.

Constraints	All major rice producing states
Lack of credit facilities	48
Inadequate availability of good varieties	47
Fertilizer application inadequate	40
Varieties available but susceptible to disease	39
Disease/ pest infestation	37
Soil needs amendment	35
Non-availability of hybrid seed	32
Lack of drainage facility	31
Fertilizer application inappropriate	23
Others	20
Poor irrigation facility	12
Lack of technical support	12
Fertilizers of required formulation not available	7
Land requires leveling	3

Note: The sum of constraints in a particular state not necessary equal to 100.
Source: Frontline Demonstrations on Rice (2003-04), Directorate of Rice Research, Indian Council of Agricultural Research, Rajendranagar, Hyderabad.

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