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# SOC STOCK AND C SEQUESTRATION IN VERTISOL AFTER 44 YEARS IN SOYBEAN-WHEAT CROPPING SYSTEM INFLUENCED BY LONG TERM FERTILIZATION

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**ABSTRACT**

**The continuing site after 44th cycle of soybean-wheat cropping system on Vertisol showed that regular application of FYM along with recommended doses of mineral fertilizers reduce bulk density. Different treatments laid out in randomized block design with four replications. Treatments were unfertilized control (UC), 100% recommended dose of N, NP, NPK, NPK+FYM and Fallow. The plot treated with 100% NPK+20tha$^{-1}$ FYM showed the lowest value of bulk density (1.29 Mg/m$^{-3}$) in surface soil layer as compared to other treatments. Soil organic C sequestration process led to the removal of atmospheric C and stored in the sink, this process is important for enhancement and sustaining of soil fertility and crop productivity in agricultural land. SOC sequestration rates mainly concerned with the quality and quantity of organic amendments, soil type and climate.**

***Keywords :*** *50C, stock, soyabeen, wheat cropping, fertilization.*

## INTRODUCTION

In agricultural lands, soil C sequestration plays an important role to enhance soil carbon storage for carbon trade and mitigate $CO_2$ emission as well as to improve and sustain soil fertility status and increase crop productivity. The relationship between carbon inputs i.e. crop residues and organic amendments and the rate of soil carbon decomposition resulted the accumulation of carbon in soils. The storage of carbon in soil mainly affected by climatic factors, soil temperature, soil types and activity of soil microbes (Cooper *et al* 2011). Regular application of organic manure like FYM improve the soil carbon status in soil to the equilibrium level and maintain a balance between inputs and decomposition of carbon (Kallenbach *et al* 2016).

To improve soil physical, chemical and biological health and maintain plant nutrients status in soil, it is very essential to sustain the level of soil organic matter in the soil. Maintenance of SOC in soil is also necessary for crop productivity since it directly affect the yield (Allison 1973). Thus, SOC is important index for soil quality (Combell *et al* 1996). There is a strong positive correlation between total organic carbon contents and organic manure supplied through crop residues or external source like FYM (Paustian *et al* 1992). There is a linear relationship between gross C input and variation in SOC (Ramussen and Collins 1991).

The net variation in SOC status concerned not only to present management practices but also related to previous practices. Therefore, long term fertilizer experiments are conducted to study the

impact of continuous cropping and regular application of fertilizer in long term (Leigh and Johnston 1994).

Carbon sequestration is a process by which carbon is removed from the atmosphere and stored in the sinks like crop and soil (Lal R. 2004). In this process atmospheric $CO_2$ transferred to the soil through crops, crop residues and other organic materials as a part of soil organic material (humus) (IPCC, 2006). Carbon storage is increase in SOC stocks over time in the soils of a given land unit, not necessarily related to net removal of atmospheric $CO_2$ (Cosentino *et al* 2006). If the inputs of organic carbon to the soil are higher than the output of SOC of mineralization or erosion then stock of SOC will increases (Claire Chenu 2018). Inclusions of organic matter along with mineral fertilizers improve SOC status in soil and enhance soil microbial activity due to increased biomass production through litter and crop residues. Addition of organic matter also influences the soil aggregation stability.

Long term fertilizer experiments showed that to improve and sustain soil fertility and crop productivity, a judicious application of organic amendments with inorganic fertilizers is necessary. Soil organic carbon dynamics can be regulating via fertilizer application and crop rotation through their impact on soil biological activity. Therefore, the objectives of this study to assess the impact of long term (44 years) application of inorganic fertilizers and FYM in soybean-wheat crop rotation on SOC, SOC stocks and crop yields.

## MATERIALS AND METHODS

### 2.1 Site description

The investigation was carried out in an on-going long-term fertilization experiment (LTFE) started in 1972 under the programme "All India Co-ordinated Research Project on long term fertilization experiments (AICRP-LTFE) at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (MP) India. The site is situated at $79^0$57E, $23^0$10 N, at 393m above mean sea level and has a semi-arid and subtropical climate. The soils are classified as Vertisol as per US classification of soil. The soil of the experimental field is medium black belonging to Kheri series of fine montmorillonitic hyperthermic family of *Typic Haplusterts*. Soil is neutral in reaction. It swells by wetting and shrinks when dries. Therefore deep and wide cracks develop during summer season. Soil of the experiment site is clayey in texture with available N and P in low range while available K in medium range.

### 2.2 Experimental Details

The experiment was continued with an annual three crop rotation of soybean (*Glycine max* L.), wheat (*Triticumaestivum* L.) and fodder maize (*Zea mays* L.) up to 1994. In the rotation, soybean was grown as a rainfed crop in the rainy season (June–September). Wheat was grown in the winter season (December–March) with three irrigations applied during crown root initiation, maximum tillering and flowering stage of the crop, while fodder maize was grown in the summer seasons (April–June) with one or two irrigations based on the crops need. Fodder maize was harvested at about 65 days after sowing. After 1994, fodder maize was discontinued due to the unavailability of irrigation water during the summer season the soybean–wheat rotation has been continuing since then. Conventional tillage practices (two preparatory tillage operations by duck-foot cultivator) were applied to each crop for preparation of seed beds. Recommended weed control and plant protection measures were adopted in all the crops throughout the period of experimentation. The experiment was laid out in a randomized block design with ten treatments replicated four times with a plot size of 17 m × 10.5 m. For the present investigation 5 out of the 10 treatments and an uncultivated and

unfertilized fallow plot under undistributed vegetation were selected to answer some specific questions. The treatments selected were control (treatment where crops were raised without any nutrient application; UC), 100% nitrogen (N), 100% N and P (NP), 100% N, P and K (NPK), 100% NPK + farmyard manure (NPKM). Recommended fertilizer doses of NPK (100%) for soybean were 20:80:20 $Kgha^{-1}$ N: P: K and for wheat was 20:80:40 $Kgha^{-1}$ N: P: K. Urea, diammonium phosphate and murate of potash were the sources of N, P and K, respectively. Farmyard manure was applied once in every year only to the soybean at 15 Mg $ha^{-1}$ (on dry weight basis). On an average, the FYM contained 0.65% N, 0.14% P and 0.60% K on a dry weight basis.

**2.3 Collection and Processing of Soil Samples**

The soil was sampled from experimental plots after soybean and wheat harvest in 2016-17. An uncultivated and unfertilized fallow plot under undistributed vegetation was also sampled. Soil samples were collected from a depth of 0-30 cm. Four 8 cm diameter cores were collected from each plot, divided in to 0-15and 15-30cm increments, and composited by depth. Soil was passed through a 2mm sieve. A sub sample was stored at field-moist for biochemical analysis and the remainder was air-dried and stored for biochemical analysis. All soil was stored at 4 $^0$C in polyethylene bags prior to analysis.

**2.4 Soil Analysis**

Bulk density was determined by the method as described by Blake and Hartage (1986) and SOC was determined by Dry ashing/TOC analyzer method described by Nelson and Sommer (1982).

Carbon accumulation, C sequestration measurement and Total SOC stock was calculated as Soil Sequestration rate= SOC stock ($kgha^{-1}$) = D x OC (%) X BD/100

Where D is depth of the soil in cm, OC is soil organic carbon in percentage and BD is bulk density ($Mgm^{-3}$).

C-Sequestration rate ($Kgha^{-1}yr^{-1}$) =

$$\frac{\text{Final SOC } (kgha^{-1}) - \text{Initial SOC } (kgha^{-1})}{\text{Time (year)}}$$

**2.5 Statistical analysis**

The data were analyzed for statistical significance using Tukey's honestly significant difference test as a post hoc mean separation test ($P < 0.05$) as applicable to randomized block using SAS 9.3 (SAS Institute, Cary, North Carolina, USA). And one way analysis of variance (ANOVA) was performed to determine the effects of farmyard manure, N, P and K and their interaction on soil biochemical parameters. Simple correlation analyses were performed to determine their relationship.

**RESULTS AND DISCUSSIONS**

**Influence of long- term fertilization on Soil Bulk Density**

Continuous use of mineral fertilizer and organic manure significantly affects the bulk density. In the treatments where organic amendments are not applied showed increased bulk density over initial value. Inclusion of farm yard manure conjoint with inorganic fertilizer showed the lower bulk density (BD) in 0-15cm soil depth as compared to mere application of inorganic fertilizer and unfertilized plot. Bulk density increased due to imbalanced use of NPK as well as with decreasing soil depth. Highest bulk density (1.44 $Mgm^{-3}$) was recorded under the control at 15-30cm depth and NPK+FYM treated plot showed the lowest bulk density (1.29 $Mgm^{-3}$). Incorporation of FYM with mineral fertilizer significantly influenced the soil aggregation which led to reduction in bulk density. Proper soil aeration and improved soil structure reduced the bulk density; this might be due to

accumulation of sol organic carbon and enhance root biomass by the application of FYM to soil. Leaf fall and root biomass and rhizo deposition also enhance the storage of SOC.

Application of fertilizer with or without FYM decreased bulk density, except control. Soil structure and soil aggregation improved due to application of FYM hence resulting improved soil physical condition which might be the most effective reason for reduction in bulk density

Sharma *et al* (1995) reported the similar results and observed that addition of organic matter reduce the bulk density in soil. Physical health of soil also depends on soil structure. Inclusion of FYM reduces the bulk density and improves soil structure and soil aeration might be due to higher root biomass and higher concentration of SOC. (Halvorson *et al* 1999).

**Table - 1 : Initial soil characteristics of the experimental field (1972)**

| Particulars | Values |
|---|---|
| Soil Classification | *Typic Haplustert* |
| Taxonomic group | Vertisol |
| Texture | |
| Sand ($gkg^{-1}$) | 253 |
| Silt ($gkg^{-1}$) | 179 |
| Clay ($gkg^{-1}$) | 568 |
| pH (1:2. Soil/water) | 7.6 |
| Total Organic Carbon($gkg^{-1}$) | 5.7 |
| Bulk density ($Mgm^{-3}$) | 1.3 |

**Table - 2 : TOC and BD affected by long term fertilization under soybean-wheat cropping system**

| Treatment# | TOC (%) | | Bulk density ($Mgm^{-3}$) | |
|---|---|---|---|---|
| | 0-15 cm | 15-30cm | 0-15 cm | 15-30cm |
| NPKM | 1.38a | 0.62a | 1.29 | 1.34 |
| NPK | 0.89b | 0.49b | 1.35 | 1.40 |
| NP | 0.74c | 0.41c | 1.36 | 1.37 |
| N | 0.68cd | 0.39c | 1.36 | 1.39 |
| UC | 0.65d | 0.38c | 1.39 | 1.44 |
| F | 0.70cd | 0.46b | 1.38 | 1.42 |

**Table - 3 : Total soil organic C stock (0-30 cm) and accumulation rate (calculated over fallow land) in surface and subsurface layers as affected by 44 years of fertilization under a soybean-wheat cropping system in Vertisol**

| Treatment# | SOC stock (0-30 cm) (Mg $ha^{-1}$) | SOC accumulation rate (0-15 cm) (kg $ha^{-1} yr^{-1}$) | SOC accumulation rate (15-30 cm) (kg $ha^{-1} yr^{-1}$) |
|---|---|---|---|
| NPKM | 35.3a | 194.02a | 61.95a |
| NPK | 28.31b | 82.15b | 11.44b |
| NP | 23.52c | 14.09c | -31.92c |
| N | 22.0c | -14.37d | -38.76c |
| UC | 21.76c | -21.80d | -36.98c |
| F | 24.29c | - | - |

#See Materials and methods for Treatment details. Means with similar lower-case letters within a column are not significantly different at P < 0.05 according to Tukey's HSD test.

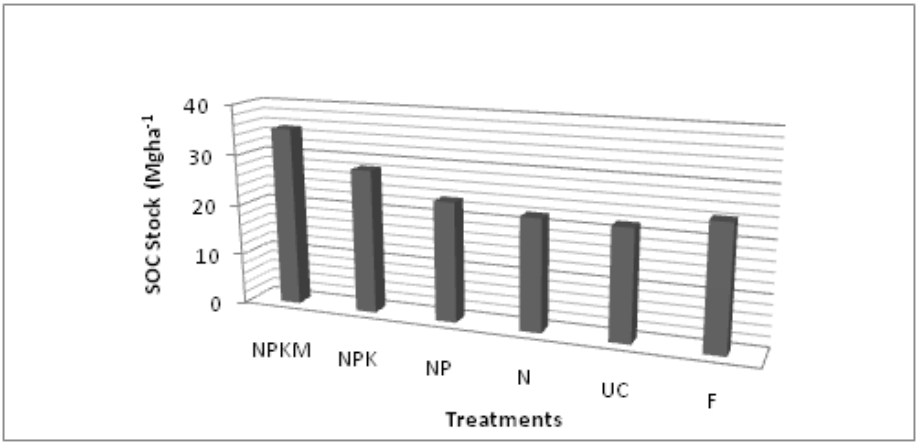


**Fig. - 1 : Soil Organic C stock affected by long term fertilizer experiment.**

**Soil Organic Carbon**

In 44 years of field experiment the content of SOC ranges from 1.38 % to 0.65 % over its initial value (0.57%). The highest value of SOC was recorded in the treatment receiving organic manure (13.8gkg$^{-1}$) along with mineral fertilizer and lowest value was obtained in the control (6.5gkg$^{-1}$) after 44 years of long term fertilizer experiment. It clearly indicated that application of FYM significantly increased ($p<0.05$) the SOC content as compared to chemical fertilizer alone or unfertilized plot. NPK +FYM treated plot showed higher amount of soil organic C stock, carbon sequestration and C sequestration rate. In control SOC concentration increased over its initial value due to addition of C through leaf fall, root and plant biomass. (Ved Prakash *et al* 2002).

Manures consists major percentage of recalcitrant organic compounds which led the remarkable increase in SOC concentration and C stocks. Drinkwater *et al* (1998) and Liu *et al* (2014). Addition of organic manure in long term improves SOC stabilization (Ding *et al* 2012).

Long term fertilization impact on carbon storage

After the 44$^{th}$ cycle of long term fertilizer experiment SOC stock varied from 21.76 to 35.3 Mgha$^{-1}$. NPK+FYM showed the higher SOC stock value (35.3 Mgha$^{-1}$) followed by 100% NPK (28.31Mgha$^{-1}$) and lowest value was recorded in control (21.76 Mgha$^{-1}$) followed by 100% N alone (22.0 Mgha$^{-1}$).

Total soil organic carbon stock percentage enhanced by 25 and 45% in the plot treated with NPK+FYM over mineral fertilizer and unfertilized plot. (Table-3)

After 44 years of cultivation 100% NP, 100%N, Control and Fallow plots showed the same amount of SOC stocks. The plot treated with FYM showed higher rate of SOC accumulation and its value was 2.4 and 5.4 times higher than 100% NPK plot for 0-15cm and 15-30cm soil layer, respectively. In subsurface layer accumulation rate of SOC was faster as compared to surface soil layer. At 0-15cm soil depth 100% NP showed the SOC accumulation but at 15-30cm depth the depletion of SOC was observed similar to control and 100% N alone. (Table-3).

In control and 100% N alone an accelerated depletion rate of SOC at 15-30 cm soil depth might be due to considerably lower proportions of small

and large macro aggregates (Figure-) and lower humification rate and higher activities of soil microbes,

SOC sequestration rate varied from 194.02 to -14.37 kg/ha/yr in 100% NPK+FYM to unfertilized plot in surface soil and from 61.95 to -38.76 kg/ha/yr in subsurface soil.

Soil Sequestration rate= SOC stock ($kgha^{-1}$) = D x OC (%) X BD/100

It was observed that soil organic carbon sequestration rate significantly influenced by application of balanced fertilization with organic manure. The interrelation between SOC stock and bulk density (Fig.) showed positive and significant correlation between them.

Accumulation rate of SOC and annual carbon input show the soil organic C sequestration efficiency. Continuous application of integrated nutrients fertilized and intensive cropping enhance the C sequestration ratio. The relationship between annual C input and SOC accumulation rate indicate the SOC sequestration efficiency. Soil carbon sequestration and crop yields significantly increased by regular application of organic and inorganic fertilizer and also resulted in enhancement in SOC stocks and soil fertility.

The percentage of crop residue like stubble, root biomass and rhizo deposition increased due to continuous application or organic amendments along with inorganic fertilizer which led to higher organic matter in the soil. The plot treated with NPK+FYM responsible for the higher concentration of organic pools in the soil. (Liel *et al* 2010, Bhattacharya *et al* 2011).

Regular application of fertilizer and FYM in long term increased the status of soil organic pools of carbon which might be due to priming effect of applied nutrients through FYM. Inclusion of organic amendments enhanced the microbial activity and deposition of SOC. (Yagi *et al* 2005). Application of organic amendments improves the SOC sequestration which helps to sustain and increase soil fertility and crop productivity.

Soil management practices like afforestation (Laik *et al* 2009), conversation tillage (Liu *et al* 2014) and recommended application of fertilizer (Yang *et al* 2012) considerably influence the status of soil organic pools and carbon sequestration in soil. Johnston *et al* (2009) reported that application of mineral fertilizer in long term enhance the SOC stocks in the top soil layer.

**CONCLUSIONS**

The present study revealed that in unfertilized plot the net supply of $Co_2$ would be through soil only. The plot treated with inorganic fertilizer in substantial increment were sufficient to fulfill the requirement of SOC, whereas application of organic manure, interestingly the rate of SOC accumulation and C sequestration over control. At 0-15cm soil layer the rate was higher than 15-30cm soil depth. However, the SOC concentration was higher in the plot treated with inorganic fertilizer over control. But addition of FYM showed the higher SOC and crop productivity of both soybean and wheat crops. The SOC accumulation rates (over the fallow plots) in the NPK+FYM were ~112 and 50kg $ha^{-1}$ $yr^{-1}$ higher than the NPK plots. In the 0–15cm and 15–30cm soil layers, both NPK+FYM despite having lower macro aggregates than fallow land could store higher amount of C that fallow and other plots

The study clearly showed that 44 years of continuous application of organic matter and inorganic fertilizers considerably decrease the soil bulk density, improved SOC stocks and concentration over mere application of inorganic fertilizer and control in soybean-wheat system on Vertisol.

Practice of integrated nutrient management enhances the C sequestration and nutrient cycle as compared to mineral fertilizer treatment. In short, inclusion of organic manure along with mineral fertilizer promotes the SOC status and improved soil health in Vertisol.

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# STUDY OF AVIAN FAUNA OF VEHICLE FACTORY JABALPUR, JABALPUR, MADHYA PRADESH

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**ABSTRACT**

**The present is conducted at the Vehicle Factory estate in Jabalpur district of the state of Madhya Pradesh. The Vehicle Factory Jabalpur, also known as VFJ, is one the premier defence establishments of India which functions under the Ordnance Factory Board controlled by the Ministry of Defence, Govt of India. Since VFJ produces defence vehicles, its primary customers are Indian Armed Forces, Central Armed Police Force, State Armed Police Forces, Paramilitary Forces of India and Special Forces of India which have land based operations. It also supplies vehicles to civilians, government and private organisations. A total of 75 species of birds belonging 32 families were recorded.**

***Keywords*** *: VFJ, avian fauna, Jabalpur, diversity.*

## INTRODUCTION

The VFJ estate is spread over an area of approximately 1500 acres. Apart from the main factory the estate also has school, residential buildings, places of worship and playgrounds. An IOFS officer heads the factory and is known as the General Manager who is responsible for the overall management of the factory. The VFJ is the only supplier of the category B vehicles to the Indian Army. It has a R&D centre within the campus whose function is to develop the vehicle and related technologies to meet the present and future demands of the Army. Its research partner is Vehicle Research & Development Establishment of Defence Research and Development Organisation (DRDO). It also has tie ups with the Ashok Leyland and Tata Motors. The estate is richly populated with different types of floristic diversity both natural as well as planted. Due to the presence of such green surroundings, the estate is home to a number of species of different faunas. The current study is done within the VFJ estate as well as the areas around it namely Madai, New Kanchanpur, Shobhapur and Gokalpur to record the avian faunal diversity. In 2006, Chandra and Mahabal reported 297 species belonging to 60 families from Kanha National Park, situated in Mandla district of Madhya Pradesh. Then in 2008, 194 avian species from Jabalpur district of Madhya Pradesh were described by both the same scientists on the basis of past records, actual sightings and collections during the surveys conducted between 2001 to 2003. A total of 75 species of birds belonging 32 families were recorded while the field visits during the day as well night. The night time data was collected to record the nocturnal birds found in the area.

## MATERIALS AND METHODS

In present study the data pertaining to avian fauna of the selected area is collected by point collection method during the field visits. The visits were usually conducted during morning and evening hours, as at these times the birds are found to be most active. Filed visits were also carried out during afternoon to study the other activities of birds. Few night trails were also organised in order to spot the nocturnal bird. After spotting the bird, their visible characters like colour, feather patterns, nesting habits etc were noted and are matched with the literature available. The snapshots of the birds were also taken as per the convenience. Many times, indirect methods of identification like calls, silhouettes etc were also implemented for identifying the bird.

## RESULTS AND DISCUSSION

The compiled list of the 75-species found in the area is as follows-

**Table - 1 : List of bird species spotted at VFJ Estate, Jabalpur**

| S. No. | Family | Common Name | Scientific Name | Abundance | Local Status | IUCN Status |
|---|---|---|---|---|---|---|
| 1 | Phasianidae | Painted Francolin | *Francolinus pictus* | UC | R | LC |
| 2 | | Grey Francolin | *Francolinus pondicerianus* | C | R | LC |
| 3 | | Grey Francolin | *Francolinus pondicerianus* | C | R | LC |
| 4 | | Red Junglefowl | *Gallus gallus* | C | R | LC |
| 5 | | Indian Peafowl | *Pavo cristatus* | C | R | LC |
| 6 | Anatidae | Lesser Whistling Duck | *Dendrocygna javanica* | C | R | LC |
| 7 | | Common Teal | *Anas crecca* | C | WM | LC |
| 8 | Ciconiidae | Painted Stork | *Mycteria leucocephala* | C | R | NT |
| 9 | | Lesser Adjutant | *Leptoptilos javanicus* | UC | WM | VU |
| 10 | Ardeidae | Yellow Bittern | *Ixobrychus sinensis* | FC | R | LC |
| 11 | | Indian Pond Heron | *Ardeola grayii* | C | R | LC |
| 12 | | Purple Heron | *Ardea purpurea* | UC | R | LC |
| 13 | | Cattle Egret | *Bubulcus ibis* | C | R | LC |
| 14 | | Intermediate Egret | *Mesophoyx intermedia* | C | R | LC |
| 15 | Accipitridae | Black-winged Kite | *Elanus caeruleus* | C | R | LC |
| 16 | | Oriental Honey Buzzard | *Pernis ptilorhynchus* | C | R | LC |
| 17 | | Shikra | *Accipiter badius* | C | R | LC |
| 18 | Burhinidae | Indian Thick-knee | *Burhinus indicus* | FC | R | LC |
| 19 | Charadriidae | Red-wattled Lapwing | *Vanellus indicus* | C | R | LC |
| 20 | | Little Ringed Plover | *Charadrius dubius* | C | R | LC |
| 21 | Jacanidae | Pheasant-tailed Jacana | *Hydrophasianus chirurgus* | FC | R | LC |
| 22 | | Bronze-winged Jacana | *Metopidius indicus* | C | R | LC |

| S. No. | Family | Common Name | Scientific Name | Abundance | Local Status | IUCN Status |
|---|---|---|---|---|---|---|
| 23 | Columbidae | Rock Pigeon | *Columba livia* | C | R | LC |
| 24 | | Eurasian Collared Dove | *Streptopelia decaocto* | FC | R | LC |
| 25 | | Laughing Dove | *Stigmatopelia senegalensis* | C | R | LC |
| 26 | | Yellow-footed Green Pigeon | *Treron phoenicopterus* | C | R | LC |
| 27 | | Emerald Dove | *Chalcophaps indica* | UC | R | LC |
| 28 | Psittacidae | Rose-ringed Parakeet | *Psittacula krameri* | C | R | LC |
| 29 | | Plum-headed Parakeet | *Psittacula cyanocephala* | C | R | LC |
| 30 | Cuculidae | Jacobin Cuckoo | *Clamator jacobinus* | FC | SM | LC |
| 31 | | Indian Cuckoo | *Cuculus micropterus* | FC | SM | LC |
| 32 | | Asian Koel | *Eudynamys scolopaceus* | C | R | LC |
| 33 | Tytonidae | Barn Owl | *Tyto alba* | C | R | LC |
| 34 | Strigidae | Spotted Owlet | *Athene brama* | C | R | LC |
| 35 | | Eurasian Eagle Owl | *Bubo bubo* | UC | R | LC |
| 36 | | Dusky Eagle Owl | *Bubo coromandus* | R | R | LC |
| 37 | | Indian Scops Owl | *Otus bakkamoena* | UC | R | LC |
| 38 | | Oriental Scops owl | *Otus sunia* | UC | R | LC |
| 39 | Alcedinidae | Common Kingfisher | *Alcedo atthis* | C | R | LC |
| 40 | | Pied Kingfisher | *Ceryle rudis* | C | R | LC |
| 41 | Upupidae | Common Hoopoe | *Upupa epops* | C | R | LC |
| 42 | Meropidae | Green Bee-eater | *Merops orientalis* | C | R | LC |
| 43 | Ramphastidae | Coppersmith Barbet | *Megalaima haemacephala* | C | R | LC |
| 44 | Dicruridae | Black Drongo | *Dicrurus macrocerus* | C | R | LC |
| 45 | | Ashy Drongo | *Dicrurus leucophaeus* | FC | WM | LC |
| 46 | Oriolidae | Indian Golden Oriole | *Oriolus kundoo* | FC | R | LC |
| 47 | Corvidae | Indian Jungle Crow | *Corvus macrorhynchos* | C | R | LC |
| 48 | | House Crow | *Corvus splendens* | C | R | LC |
| 49 | Paridae | Great Tit | *Parus major* | FC | R | LC |
| 50 | | Indian Yellow Tit | *Parus aplonotus* | FC | R | LC |
| 51 | Hirundinidae | Plain Martin | *Riparia paludicola* | FC | R | LC |
| 52 | | Dusky Crag Martin | *Ptyonoprogne concolor* | FC | R | LC |
| 53 | | Streak-throated Swallow | *Petrochelidon fluvicola* | C | R | LC |
| 54 | | Barn Swallow | *Hirundo rustica* | C | WM | LC |

| S. No. | Family | Common Name | Scientific Name | Abundance | Local Status | IUCN Status |
|---|---|---|---|---|---|---|
| 55 | Cisticolidae | Jungle Prinia | *Prinia sylvatica* | FC | R | LC |
| 56 | | Ashy Prinia | *Prinia socialis* | C | R | LC |
| 57 | | Plain Prinia | *Prinia inornata* | C | R | LC |
| 58 | Pycnonotidae | Red-whiskered Bulbul | *Pycnonotus jacosus* | UC | R | LC |
| 59 | | Red-vented Bulbul | *Pycnonotus cafer* | C | R | LC |
| 60 | Timaliidae | Jungle Babbler | *Turoides striata* | C | R | LC |
| 61 | Zosteropidae | Oriental White-eye | *Zosterops palpebrosus* | C | R | LC |
| 62 | Muscicapidae | Bluethroat | *Luscinia svecica* | C | WM | LC |
| 63 | | Oriental Magpie Robin | *Copscychus saularis* | C | R | LC |
| 64 | | Indian Robin | *Saxicoloides fulicatus* | C | R | LC |
| 65 | | Pied Bushchat | *Saxicola caprata* | C | R | LC |
| 66 | | Verditer Flycatcher | *Eumyias thalassinus* | FC | WM | LC |
| 67 | Passeridae | House Sparrow | *Passer domesticus* | C | R | LC |
| 68 | Estrildidae | Scaly-breasted Munia | *Lonchura punctulata* | C | R | LC |
| 69 | Motacillidae | Yellow Wagtail | *Motacilla flava* | FC | WM | LC |
| 70 | | Citrine Wagtail | *Motacilla citreola* | FC | WM | LC |
| 71 | | Paddyfield Pipit | *Anthus rufulus* | C | R | LC |
| 72 | | Tree Pipit | *Anthus trivialis* | FC | WM | LC |
| 73 | Fringillidae | Common Rosefinch | *Carpodacus erythrinus* | FC | WM | LC |
| 74 | Emberizidae | Crested Bunting | *Melophus lathami* | UC | R | LC |
| 75 | | Black-headed Bunting | *Emberiza melanocephala* | UC | WM | LC |

**Abbreviations Abundance :**

C=Common,
FC=Fairly Common,
UC=Uncommon,
R=Rare

**Local Status :**

R=Resident,
WM=Winter Migrant,
SM=Summer

**MigrantIUCN STATUS :**

CR=Critically Endangered,
EN=Endangered,
VU=Vulnerable,
NT=Near Threatened

From the above data it is clear that the families Phasianidae, Ardeidae, Columbidae, Strigidae and Muscicapidae has maximum number of species ie 5 each while on the other hand families like Burhinidae, Tytonidae, Upupidae, Meropidae, Ramphastidae, Oriolidae, Timaliidae, Zosteropidae, Passeridae, Estrildidae and Fringillidae has the least representation with only one species each.

**Table - 2 : Family wise distribution of bird species**

| S. No. | Family | No. of Species |
|---|---|---|
| 1 | Phasianidae | 5 |
| 2 | Ardeidae | 5 |
| 3 | Columbidae | 5 |
| 4 | Strigidae | 5 |
| 5 | Muscicapidae | 5 |
| 6 | Hirundinidae | 4 |
| 7 | Motacillidae | 4 |
| 8 | Accipitridae | 3 |
| 9 | Cuculidae | 3 |
| 10 | Cisticolidae | 3 |
| 11 | Anatidae | 2 |
| 12 | Ciconiidae | 2 |
| 13 | Charadriidae | 2 |
| 14 | Jacanidae | 2 |
| 15 | Psittacidae | 2 |
| 16 | Alcedinidae | 2 |
| 17 | Dicruridae | 2 |
| 18 | Corvidae | 2 |
| 19 | Paridae | 2 |
| 20 | Pycnonotidae | 2 |
| 21 | Emberizidae | 2 |
| 22 | Burhinidae | 1 |
| 23 | Tytonidae | 1 |
| 24 | Upupidae | 1 |
| 25 | Meropidae | 1 |
| 26 | Ramphastidae | 1 |
| 27 | Oriolidae | 1 |
| 28 | Timaliidae | 1 |
| 29 | Zosteropidae | 1 |
| 30 | Passeridae | 1 |
| 31 | Estrildidae | 1 |
| 32 | Fringillidae | 1 |
| **Total Species** | | 75 |

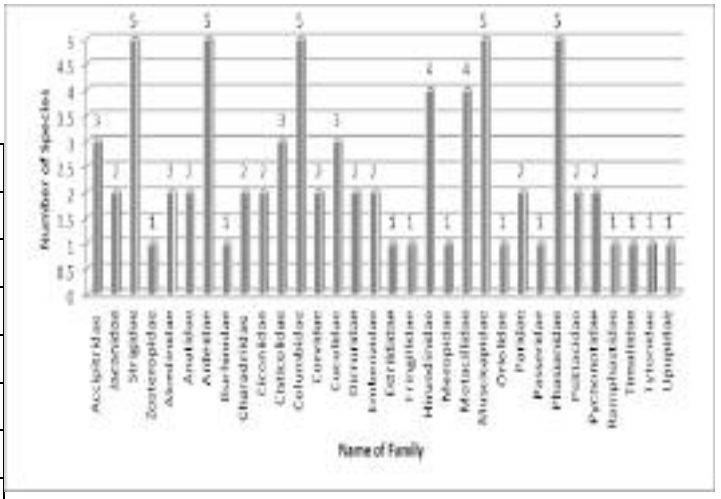


**Fig. - 1 : Graph showing Family wise distribution of bird species**

If we take a look at the relative abundance of the avian species in the study area, we will see that out of the 75 reported species, 62 species are resident while 2 species i.e. Jacobin Cuckoo and Indian Cuckoo are summer migrant and 11 species are winter migrants to the area. The winter migrant included Common Teal, Lesser Adjutant, Ashy Drongo, Barn Swallow, Bluethroat, Verditer Flycatcher, Yellow Wagtail, Citrine Wagtail, Tree Pipit, Common Rosefinch and Black-headed Bunting.

**Table - 3 : Showing relative abundance of the bird species**

| Local Abundance | Number of Species |
|---|---|
| R | 62 |
| SM | 2 |
| WM | 11 |
| **Total Species** | 75 |

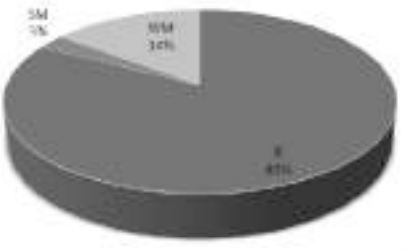

**Fig. - 2 : Pie chart showing relative abundance of the bird species**

In present study, out of the 75 species, an species of Painted Stork, Mycteria leucocephala and Lesser Adutant, Leptoptilos javanicus were recorded which are listed as near threatened and vulnerable as per the IUCN Red Data list.

**Table - 4 : List of number of species as per their IUCN status**

| IUCN Status | Number of Species |
|---|---|
| LC | 73 |
| NT | 1 |
| VU | 1 |
| Total Species | 75 |

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# PROBLEMS FACED BY PARTICIPATING AND NON PARTICIPATING CHICK-PEA GROWERS UNDER KVK TRAINING PROGRAMMES AND THEIR SOCIO-ECONOMIC ATTRIBUTES

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**ABSTRACT**

**The study has been conducted to analyse the main reasons for technological gap of chickpeacultivation in respect of adoption ofchickpea production technology among farmers ofSikrara and Buxa blocks of JaunpurDistrict(Uttar Pradesh). The study was conducted regarding the knowledge and experience of farmers about production of chickpeacrop in respect to adoption of chickpea production technologies. The strongest constraint faced by farmers was abundancy of Estray Animals in the area of chickpea growers followed by Scattered Landholdings, Poor economic condition of chickpea growers,Poor produce procurement policy of government,Lack of infrastructure facilities for effective training of chickpea growers, respectively. These were some of the important reasons of technological gap in adoption of chickpea production technology. Some socio-economic attributes resulted that most of farmers were of middle age group and have low category of annual income. It also influences the intensity of constraints .**

***Keywords :*** *Adoption, Constraints, estray animals, intensity, technology, participating, respondents .*

## INTRODUCTION

The Krishi Vigyan Kendra (K.V.K.) is a training and agricultural extension centre in India.The education commission (1964-1966) recommended that a vigorous effort be made to establish specialized institutions to provide vocational education in agriculture and allied field at the pre and post matriculate levels to cater the training needs of a large number of youth and farmwomen coming from rural areas. The I.C.A.R. therefore, constituted a committee in (1973) headed by “Dr. Mohan Singh Mehata” of Seva mandir Udaipur (Rajsthan) for working out a detailed plan for implementing this scheme. This committee submitted its reports in 1974. The first K.V.K. on a pilot basis was established in 1974 at Puducherry under the administrative control of the Tamil Nadu Agriculture University, Coimbatore.Krishi Vigyan Kendra Jaunpur was established in month April 2005 by ICAR under the auspices of NDUAT Kumarganj Faizabad.

Chickpea is a cool season legume crop and is grown in several countries worldwide as a food source. Seed is the main edible part of the plant and is a rich source of protein, carbohydrates and minerals especially for the vegetarian population. As in case of other legume crops, even chickpea can fix atmospheric nitrogen through its symbiotic

association with Rhizobium sp.; thus helping in enhancing the soil quality for subsequent cereal crop cultivation. Chickpea is the third most important food legume crop and India is the largest producer contributing to 65% of world's chickpea production. Even though India is the largest producer of chickpea; it still imports chickpea from other countries.

## MATERIALS AND METHODS

The study was conducted purposively in Sikrara and Buxa block of Jaunpur district due to maximum area under Chickpea cultivation. After the selection of the Block, a block wise list of the Chickpea growing farmers was prepared and 50 farmers from each Block were selected randomly. Thus, the total sample was comprises of 100 farmers. The data for the study were collected with the help of structured interview schedule by personal interview method. The schedule was specifically designed so as to cover all the objectives set forth for the investigation. The interview schedule comprised of a set of questions related to find out answers to Problems faced by participating and non participating farmers about chick pea production technology and socio-economic characteristics ( age, education, caste, land-holding, annual income) were also studied. Data were calculated on the basis of percentage .

## RESULTS AND DISCUSSION

**1 Age:**

The data of Table1 reveal that out of 100 respondents the majority i.e.54 percent were from middle age group, 34 percent belonged to young age group, whereas only 12 percent belonged to old age group.

In case of participating 52 percent belong to middle age and 34 percent, 14 percent young and old age group respectively. Similarly in case of non participating 56 percent belong to middle age and 34percent, 10 percent young and old age group respectively.

**Table - 1 : Distribution of the respondents according to their age**

| Age | Participated | | Non participated | | Total |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Low (below 46year) | 17 | 34 | 17 | 34 | 34 |
| Medium (46-67year) | 26 | 52 | 28 | 56 | 54 |
| High (above 67year) | 07 | 14 | 05 | 10 | 12 |
| Total | 50 | 100 | 50 | 100 | 100 |

The result of present study shows that higher percentage of chickpea growers (54 %) belong to middle age group (46-67 year). The work of Singh (2001), Mishra (2008) and Ahirwar (2011) are in line of present finding.

**2 -Education:**

The data of Table 2 reveal that out of 100 respondents, the majority i.e. 23 percent were from middle school, 20 percent belonged to intermediate group, 19 percent belonged to graduate & above, 16 percent belong to high school, 12 percent belong to illiterate and 10 percent belong to primary school education group.

In case of participating, 26 percent belong to graduate and above education group, 24 percent belong to middle school, 20 percent belong to intermediate, 14 percent belong to high school and 08 percent belong to both similarly illiterate and primary school level of education group.In case of non participating, 22 percent belong to middle

education level,20 percent belong to intermediate education level, 18 percent belong to high school level of education,16 percent belong to illiterate group and 12 percent belong to both similarly primary school and graduate level of education group.

**Table - 2 : Distribution of the respondents according to their education**

| Education | Participated | | Non participated | | Total |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Illiterate | 04 | 08 | 08 | 16 | 12 |
| Primary | 04 | 08 | 06 | 12 | 10 |
| Middle | 12 | 24 | 11 | 22 | 23 |
| High school | 07 | 14 | 09 | 18 | 16 |
| Intermediate | 10 | 20 | 10 | 20 | 20 |
| Graduate & above | 13 | 26 | 06 | 12 | 19 |
| Total | 50 | 100 | 50 | 100 | 100 |

With regard to education, higher percentage of trainees (23%) was found to be educated up to middle school level. This finding finds support from the work of Jatav (2011).

**3- Caste:**

The data of Table 3 reveal that out of 100 respondents the majority i.e. 44 percent were from OBC, 30 percent belonged to general, whereas only 26 percent belonged to ST categories.

In case of participating 54 percent belong to OBC and 28 percent, 18 percent general and ST categories respectively.Similarly in case of non participating 34 percent belong to OBC and ST categories and 32percent general categories.

**Table - 3 : Distribution of the respondents according to their caste**

| Caste | Participated | | Non participated | | Total |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| General | 14 | 28 | 16 | 32 | 30 |
| OBC | 27 | 54 | 17 | 34 | 44 |
| SC/ST | 09 | 18 | 17 | 34 | 26 |
| Total | 50 | 100 | 50 | 100 | 100 |

The finding regarding caste indicated that higher percentage (44) of trainees belongs to other backward classes. This finding was found similar to work of Jatav (2011).

**4. Land holding:**

The data of Table 4 reveal that out of 100 respondents the majority i.e.92 percent were from low group, 5 percent belonged to middle group, whereas only 3 percent belonged to high land holding.

In case of participating, 90 percent belong to low land holding and 6 percent, 4 percent medium and low land holding repectively.Similarly in case of non participating, 94 percent belong to low land holding and 4 percent, 2 percent medium and low land holding, respectively.

**Table - 4 : Distribution of the respondents according to their land holding**

| Land holding | Participated | | Non participated | | Total |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Low (below 8 acre) | 45 | 90 | 47 | 94 | 92 |
| Medium(8-11acre) | 03 | 06 | 02 | 04 | 05 |
| High (above 11acre) | 02 | 04 | 01 | 02 | 03 |
| Total | 50 | 100 | 50 | 100 | 100 |

Regarding size of land holding is concerned; it was observed that higher percentage (92) of the chickpea trainees had small size of land holding. Due to small size of land holding, the trainees might be attracted for receiving training to raise their production level. The work of Tiwari (2005) supported the present finding.

**5- Income:**

The data of Table-5 reveal that out of 100 respondents the majority i.e. 44 percent were from low income group,31 percent belonged to medium income group, whereas only 25 percent belonged to high income group.

Similarly in case of participating, 34 percent belong to medium income and high income group and 32 percent belong to low income group.In case of non-participating 56 percent belong to low income and 28 percent,16 percent medium and old high income group respectively.

**Table - 5 : Distribution of the respondents according to their income**

| Income | Participated | | Non participated | | Total |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Low (<56000 Rs) | 16 | 32 | 28 | 56 | 44 |
| Medium (56000-76000 Rs) | 17 | 34 | 14 | 28 | 31 |
| High (>76000 Rs) | 17 | 34 | 08 | 16 | 25 |
| Total | 50 | 100 | 50 | 100 | 100 |

The majority respondents (44 percent) were of low income (less than Rs56000), followed by 31 percent growers of medium income (Rs 56000-Rs 76000) and only 25 percent growers were of high income (above Rs 76000). The finding finds support with the work Mishra (2008) and Ahirwar (2011).

**6 - Problems faced by participating and non participating farmers:**

During investigation, trainees were reported many problems due to which they could not adopt recommended chickpea production technology. About 85 percent respondents reported the problem of estray animal, 81 percent respondents problem faced of scattered land holding, 67 percent respondents faced the problem of poor economic condition, 64 percent poor produce procurement policy of government, 60 percent respondents have lack of infrastructure facilities for effective use of training in terms of chickpea production technology, 48 percent farmers problem faced of High cost of plant protection measures,45 percent have Low socio-economic status of participants and 30 percent Farmers were not attending training programmes regularly.

**Table - 6 : Problems faced by participating and non participating farmers**

| S.No. | Problems | No. of respondents | Percentage | Rank |
|---|---|---|---|---|
| 1 | High cost of plant protection measures | 48 | 48 | VI |
| 2 | Poor economic condition of the chickpea growers | 67 | 67 | III |
| 3 | Farmers not attending training programme regularly | 30 | 30 | VIII |
| 4 | Estray animal | 85 | 85 | I |
| 5 | Low socio-economic status of participants | 45 | 45 | VII |
| 6 | Poor produce procurement policy of government. | 64 | 64 | IV |
| 7 | Scattered land holding | 81 | 81 | II |
| 8 | Lack of infrastructure facilities for effective use of training in terms of chickpea production technology | 60 | 60 | V |

The major constraints reported by trainees in relation to practices of improved chickpea production technology were lack of availability of sufficient audio-video visual aids, trainings were not organized as per need and interest of participants, illiteracy of participants, unable to attend training programmes regularly, lack of proper communication, lack of infrastructure facilities, low socio-economic status and insufficient number of group exercise and practical. This finding is support by Jatav (2011).

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# SOIL ENZYME ACTIVITIES AS AFFECTED BY 44TH CYCLE OF CONTINUOUS FERTILIZATION UNDER SOYBEAN-WHEAT CROPPING SYSTEM IN VERTISOL

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## ABSTRACT

**Agricultural SOC stabilization is interlinked to soil structure, soil health and microbial activity. Hence, the major objectives of this study was to assess the INM on SOC and enzyme activities in surface and sub surface layer under a soybean-wheat rotation in Vertisol. A field experiment was conducted during 2015-16 at research farm of JNKVV, Jabalpur (MP) India, on an ongoing long term (44 years) experiment which was initiated in 1972. Different treatments were laid out in randomized block design with four replications. Treatments were unfertilized control (UC), 100% recommended dose of N, NP, NPK, NPK+FYM and fallow. After 44 years of intensive double cropping NPKM and NPK plots had 82, 69% and 37, 27% higher total SOC concentration than UC and Fallow plots, respectively in 0-15cm layer. DHA and FDA activity improved in NPKM by 60 and 61% over fallow land. Higher SOC accumulation resulting maximum soil enzyme activities and improved soil health. This study suggested that integrated nutrient management system is a viable option to sustain productivity soil health and improve soil biodiversity in a long-run.**

***Keywords :*** *Fertilization, agriculture, soil quality.*

## INTRODUCTION

Long term fertilization provides major advantage to evaluate the changes in soil nutrient dynamics and balance, measuring soil quality and management sustainability. Application of imbalanced dose of chemical fertilizers adversely affects the soil quality and soil health. Imbalanced dose of chemical fertilizers seriously affects the natural environment through air, water and soil pollution (Tilman *et al* 2002). Continuous application of these chemical fertilizers without any organic amendments declines the soil fertility and yield sustainability (Foley *et al* 2005). Reduced agricultural productivity depletes the SOC status, deteriorate the soil health and reduce microbial activity (Zhong and Cai 2007). While the balanced application of mineral fertilizers in combination with organic amendments improved microbiological properties as well as soil health. Enzymes are very good and sensitive indicator to measure soil quality and microbiological activity due to their rapid response to change in biological parameters. Soil microbial biomass and soil microbial activity are the important factor for the

measurement of soil quality (Schloter *et al* 2003). Soil microbial activity and biomass give rapid response to crop and soil management practices like application of inorganic and organic fertilization (Livia *et al* 2005), tillage and fallow (Wang *et al* 2008), crop rotation ( Yusuf *et al* 2009).

In general, soil extracellular enzymes decompose substrate of different composition and complexity (Sinsabaug and Follstad Shah 2012). In the dynamics of nutrient transformation, soil enzymes play a crucial role (Mastro *et al* 2006). β-glucosidase, dehydrogenase, flurosceience diacetate, urease, acid and alkaline phosphatase are the important enzymes that take part in Soil organic carbon sequestration and recycling of soil nutrients essential for plant growth and biological activities.(Burn, 1982). Many experiments have been carried out to study the response of extracellular enzymes under long term fertilization and resulted significant variation in respect to both direction and magnitude across studies. (Burns *et al* 2013, Henry 2013, Sinsabaugh *et al* 2014). Cellulose and lignin are major component of plant biomass also influence the soil enzyme activity as well as SOC sequestration (Lill and Sun, 2014). In arable land status of SOC can be enhanced by the incorporation of crop residue. Cellulose and lignin are the major components of crop residues and significantly affect the enzymatic activity. Transformations of cellulose and lignin are complex process, carried out by microorganisms in soil. Many extracellular enzymes such as β-glucosidase take part in cellulose degradation.

Consider the above statements; present investigation was carried out to evaluate the changes in soil enzymatic activity and their interrelation with cellulose and lignin under long term fertilization in Vertisol of central India.

## MATERIALS AND METHODS

### 2.1 Site description

The investigation was carried out in an on-going long-term fertilization experiment (LTFE) started in 1972 under the programme "All India Co-ordinated Research Project on long term fertilization experiments (AICRP-LTFE) at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (MP) India. The site is situated at $79^0$57E, $23^0$10 N, at 393m above mean sea level and has a semi-arid and subtropical climate. The soils are classified as Vertisol as per US classification of soil. The soil of the experimental field is medium black belonging to Kheri series of fine montmorillonitic hyperthermic family of *Typic Haplusterts*. Soil is neutral in reaction. It swells by wetting and shrinks when dries. Therefore deep and wide cracks develop during summer season. Soil of the experiment site is clayey in texture with available N and P in low range while available K in medium range.

### 2.2 Experimental details

The experiment was continued with an annual three crop rotation of soybean (*Glycine max* L.), wheat (*Triticumaestivum* L.) and fodder maize (*Zea mays* L.) up to 1994. In the rotation, soybean was grown as a rainfed crop in the rainy season (June–September). Wheat was grown in the winter season (December–March) with three irrigations applied during crown root initiation, maximum tillering and flowering stage of the crop, while fodder maize was grown in the summer seasons (April–June) with one or two irrigations based on the crops need. Fodder maize was harvested at about 65 days after sowing. After 1994, fodder maize was discontinued due to the unavailability of irrigation water during the summer season the soybean–wheat rotation has been continuing since then. Conventional tillage practices (two preparatory tillage operations by duck-foot cultivator) were applied to each crop for preparation of seed beds.

Recommended weed control and plant protection measures were adopted in all the crops throughout the period of experimentation. The experiment was laid out in a randomized block design with ten treatments replicated four times with a plot size of 17 m × 10.5 m. For the present investigation 5 out of the 10 treatments and an uncultivated and unfertilized fallow plot under undistributed vegetation were selected to answer some specific questions. The treatments selected were control (treatment where crops were raised without any nutrient application; UC), 100% nitrogen (N), 100% N and P (NP), 100% N, P and K (NPK), 100% NPK + farmyard manure (NPKM). Recommended fertilizer doses of NPK (100%) for soybean were 20:80:20 $Kgha^{-1}$ N: P: K and for wheat was 20:80:40 $Kgha^{-1}$ N: P: K. Urea, diammonium phosphate and murate of potash were the sources of N, P and K, respectively. Farmyard manure was applied once in every year only to the soybean at 15 Mg $ha^{-1}$ (on dry weight basis). On an average, the FYM contained 0.65% N, 0.14% P and 0.60% K on a dry weight basis.

**2.3 Collection and Processing of soil samples**

The soil was sampled from experimental plots after soybean and wheat harvest in 2016-17. An uncultivated and unfertilized fallow plot under undistributed vegetation was also sampled. Soil samples were collected from a depth of 0-15 and 15-30 cm. Four 8 cm diameter cores were collected from each plot, divided in to 0-15and 15-30cm increments, and composited by depth. Soil was passed through a 2mm sieve. A sub sample was stored at field-moist for biochemical analysis and the remainder was air-dried and stored for biochemical analysis. All soil was stored at 4 $^0$C in polyethylene bags prior to analysis.

**2.4 Soil biochemical analysis**

Soil dehyrogenase activity determined by reducing 2,3,5-triphenyltetrazolium chloride (Casida *et al,* 1964). From whole soil 5 g soil sample were taken and mixed with 50mg of $CaCo_3$ and 1 ml of 3% (W/V) 2,3,5 triphenyltetrazolium chloride (TTC) and incubated for 24 hr at 37$^0$C . In the presence of dehydrogenase enzyme TTC converted in to 2,3,5 triphenylformazan (TPF). The formed TPF was extracted via (3x15ml) acetone, the extracts were filtered and the absorption of extract was measured at 485nm on spectrophotometer.

Acid phophatase and alkaline phophatase activity was measured using p-nitrophenyl phosphate according to Tabatabai and Bremmer (1969). 1 gm part of each soil sample was placed in a 50ml falcon flask and then the following were added and swirled in the flask for a few seconds, 4 ml of tris-hydroxymethyl aminomethane (TMU) with citric, maleic and boric acids, buffer (pH 4.0 for acid phosphatase assay or pH 9.0 for alkaline phosphate assay) and 1ml of p-nitrophenyl phosphate solution prepared in the same buffer. The flask was then placed in an incubator at 37$^0$C. after 1 hr of incubation, 4ml of NaOH (1 mol $L^{-1}$) and 1 ml of $CaCl_2$ (1 mol $L^{-1}$) were added and swirled for a few seconds to stop the reaction, this was then centrifuged at 10000 rpm for 2 min. color fade in the yellow calibration standards, samples and controls were measured with a spectrophotometer at 405nm.

β-glucosidase was determined using p-nitrophenyl-β-D-glucopyranoside (PNG, 0.05M) as substrate. This assay based on the release and detection of PNP. Taken 1 gm soil in 50ml volumetric flask. Added 0.25 ml of toluene, 4 pH 6.0, and 1 ml of PNG solution and swirled the flask and placed in incubator at 37$^0$C for 60min. after that added 0.5 M $CaCl_2$ and 4 ml of 0.1 M THAM buffer pH12. Filtered the suspension through whatman no.2 filter paper and yellow colour intensity measure on 420 nm using spectrophotometer.

Urease activity was measured following the method of Tabatabai and Bremmer (1972). 5 gm of soil were incubated with 5 ml of 0.05M THAM buffer (pH 9.0) and 1 ml of 0.2% of urea solution at $37^0$C for 2 hr. Excess urea was extracted with KCl-PMA solution and estimated calorimetrically at 527nm.

FDA assay was measured by method described by Schnurer abd Roswell (1982). Taken 1 gm moist soil in 50 ml conical flask and added 15 ml of 60 mM potassium buffer pH 7.6. Then added 0.2ml of 1000µg FDA $ml^{-1}$ and incubate at $30^0$C for 20 min. then added 15ml of methanol. And centrifuged at 2000 rpm for 3 min. and measured the intensity of greenish yellow colour at 490 nm using spectrophotometer.

**2.5 Statistical analysis**

The data were analyzed for statistical significance using Tukey's honestly significant difference test as a post hoc mean separation test ($P < 0.05$) as applicable to randomized block using SAS 9.3 (SAS Institute, Cary, North Carolina, USA). And one way analysis of variance (ANOVA) was performed to determine the effects of farmyard manure, N, P and K and their interaction on soil biochemical parameters. Simple correlation analyses were performed to determine their relationship.

## RESULTS AND DISCUSSION

**3.1 Status of Soil organic carbon**

Applications of organic amendments enhance the soil organic carbon status and stimulate the soil enzymatic activities. Incorporation of organic manure provides readily available Carbon acts as an energy source for soil microbes and enhances their population and microbial biomass. This dual nature of organic manure significantly influences the crop productivity in long- term.

**Table - 1 : Soil enzyme activities as affected by 44 years of fertilization under a soybean-wheat cropping system in Vertisol**

| Treatment# | B-Glucosidase ( µg PNG $g^1$ $day^{-1}$) | DHA (µg TPF $g^{-1}$ $hr^{-1}$ ) | Urease (µg $NH_4$-N $g^{-1}$ $day^{-1}$) | Acid phosphatase (µg PNP $g^1$ 2 $hr^{-1}$) | Alkaline phosphatase (µg PNP $g^1$ 2 $hr^{-1}$) | FDA(µg fluorescien $g^{-1}$ 2 $hr^{-1}$) |
|---|---|---|---|---|---|---|
| 0-15 cm | | | | | | |
| NPKM | 48.02a | 15.48a | 15.41a | 203a | 818a | 6.78a |
| NPK | 36.75b | 12.84b | 13.97b | 188b | 732b | 5.92b |
| NP | 32.82c | 10.42c | 10.87cd | 151d | 467d | 4.97c |
| N | 30.78cd | 8.82d | 10.23d | 148d | 441d | 4.26d |
| UC | 28.48d | 8.20d | 10.12d | 149d | 441d | 3.97e |
| F | 31.26c | 9.80c | 11.23c | 161c | 578c | 4.21d |
| 15-30 cm | | | | | | |
| NPKM | 37.56a | 10.14a | 10.84a | 171a | 688a | 4.42a |
| NPK | 28.74b | 8.92b | 10.6a | 158b | 617b | 4.22a |
| NP | 25.67c | 8.60c | 8.14b | 128d | 396d | 3.95b |
| N | 24.16c | 7.32d | 7.89c | 126d | 378d | 3.65c |
| UC | 22.24c | 6.64e | 7.12c | 123d | 379d | 3.60c |
| F | 24.56c | 7.88d | 8.46b | 136c | 477c | 3.88b |

#See Materials and methods for Treatment details. Means with similar lower-case letters within a column are not significantly different at $P < 0.05$ according to Tukey's HSD test.

**3.2 Soil enzyme activity affected by addition of organic manure**

Conjoint application of NPK with FYM significantly improved the activity of nutrient cycling enzymes in both soil layers. FDA and DHA activity show remarkable improvement under NPK + FYM by 61 % and 60% over 100% NPK treatment at surface layer. β-glucosidase, urease, and phosphatase activity followed the same trend. But their value found at par in 100% NP and 100% N treatments

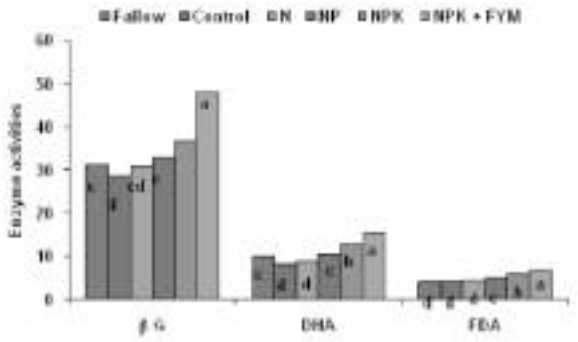


**Fig. - 1 : β-Glucosidase (β G; µg PNG $g^{-1}$ $day^{-1}$), Dehydrogenase (DHA; µg TPF $g^{-1}$ $hr^{-1}$) and Fluorescein diacetate (FDA; µg fluorescien $g^{-1}$ $^{2}$ $hr^{-1}$) activities as affected by long-term fertilization in the under a soybean-wheat cropping system in a Vertisol**

**3.2.1 Dehydrogenase Activity**

In surface layer (0-15cm) DHA showed greater activity under the influence of different fertilizer combination for 44 years, due to accumulation of higher content of organic matter through incorporation of FYM supported maximum dehydrogenase activity as compared to all other treatments. The data showed that dehydrogenase activity varied from 8.20 to 15.48 µg TPF $g^{-1}$ $24h^{-1}$ and from 6.64 to 10.14 µg TPF $g^{-1}$ $24h^{-1}$ in NPK +FYM treatment at both depths, respectively. It is clearly shown that the highest value of DHA was obtained under the plot treated with NPK in combination with FYM 15.48 µg TPF$g^{-1}$ $24h^{-1}$ at 0-15cm depth and 10.14 µg TPF $g^{-1}$ $24h^{-1}$ at 15-30 cm soil depth ,followed by in 150%NPK treated plot. This might be due to improvement of SOC, N, P status, root biomass and proliferation of soil micro biota leading to stimulate microbial and enzymatic activity. The minimum value was recorded in unfertilized plot (Control) at both depths.

**3.2.2 Phosphatase Activity**

Phosphatase enzymes catalyze the hydrolysis of esters and anhydrides of phosphoric acid. (Condron *et al*., 2005). In soil phosphatase enzyme originates from plant and microorganisms. In soil concentration of phosphatase varies according to extent of organic material, application of organic and inorganic fertilizers and management practices. (Banerjee *et al.,* 2012). The data presented on the phosphatase activity revealed that the significant greater value of acid and alkaline phosphatase was observed under the plot treated with balanced fertilization integrated with organic manure. In surface layer acid phosphatase activity varied from 203 to 148 µgPNP$g^{-1}h^{-1}$. The phosphatase activity was lowest in 100% N alone and found at par with the unfertilized plot. Alkaline phosphatase varied from 818 µgPNP$g^{-1}h^{-1}$ to 441 µgPNP$g^{-1}h^{-1}$. In both the treatment 100% N alone and control (no fertilizer) showed the lowest and similar value. Similar trend was observed in sub surface layer.

**3.2.3 β-glucosidase Activity**

β-glucosidase showed the highest activity under the plot received mineral fertilizers along with organic amendments. 100% N and control showed no significant difference in β-glucosidase activity. The data perusal on β-glucosidase showed that ranges from 28.48 to 48.02 µg PNG $g^{-1}day^{-1}$ in surface soil (0-15cm depth). Highest value was

observed in the plot treated with mineral fertilizer along with organic manure (48.02 µg PNG $g^{-1}day^{-1}$ Followed by the 150% NPK. And the least value was recorded in the control. In subsurface soil the value ranges from 22.24 to 37.56 µg PNG $g^{-1}day^{-1}$.

**3.2.4 Urease Activity**

Under the integrated nutrient management urease activity greatly influenced with or without the incorporation of FYM at both soil depths. The urease activity varied from 10.12 µg $NH_4$-N $g^{-1}$ $day^{-1}$ to15.41 µg $NH_4$-N $g^{-1}$ $day^{-1}$. Its highest activity was observed under the treatment receiving mineral fertilizer conjoint with organic manure (15.41 µg $NH_4$-N $g^{-1}$ $day^{-1}$). Urease activity was lowest in unfertilized plot (7.12 µg $NH_4$-N $g^{-1}$ $day^{-1}$) and found at par with N only treatment (7.89 µg $NH_4$-N $g^{-1}$ $day^{-1}$). Sub surface soil depth followed the same trend. The significant effect of FYM on urease activity may be attributed to higher concentration of organic C and N that led to higher urease activity. The Nutrients supply through organic source leave stimulatory effect on urease activity. (Bhatt *et al* 2016). The treatments with organic manure and inorganic fertilizers remarkably increased the soil urease activity and the activity of this enzyme declined with decrease in soil depth.

**3.2.5 Fluoresceine Diactate Activity**

Continuous application of fertilizers significantly affects the SOC retention and dynamics. Marked differences in fluorescien diacetate hydrolysis (FDA) concentration which values lying between 6.78µg fluorescien $g^{-1}$ $2hr^{-1}$ (surface soil) and 4.42 fluorescien $g^{-1}$ $2hr^{-1}$ (sub surface soil) in NPK +FYM treatment to 3.97 fluorescien $g^{-1}$ $2hr^{-1}$ (surface soil) and 3.60 fluorescien $g^{-1}$ $2hr^{-1}$ (sub surface soil) in control were recorded in correspondence to various treatments. (Table-). Lowest value of FDA recorded in control. FDA hydrolysis activity decreased under imbalanced application of fertilizer. (Stark *et al* 2007). But there two treatments were equally effective in increasing the FDA activity in soil. In case of mineral fertilizer application of higher dose of NPK improved FDA activity in soil. Highest FDA activity was recorded with the plot treated with 100% NPK+FYM followed by 150% NPK.

**Table - 2 : Role of lignin to cellulose ratio in plant biomass on soil enzyme activities and their impact on soil organic carbon stock in a Vertisol**

| Variables | BG | DHA | URE | AP | ALP | FDA | SW | RW | SS | RS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 0-15 cm | | | | | |
| SW | 0.756* | 0.663* | 0.528NS | 0.485NS | 0.468NS | 0.645* | | | | |
| RW | 0.808** | 0.711* | 0.591NS | 0.556NS | 0.536NS | 0.689* | 0.994** | | | |
| SS | 0.618* | 0.480NS | 0.325NS | 0.278NS | 0.261NS | 0.461NS | 0.891** | 0.871** | | |
| RS | 0.606* | 0.467NS | 0.311NS | 0.263NS | 0.247NS | 0.449NS | 0.883** | 0.862** | 0.984** | |
| SOC stock | 0.918** | 0.850** | 0.748* | 0.713* | 0.700* | 0.834** | 0.948** | 0.965** | 0.848** | 0.839** |
| | | | | | 15 -30 cm | | | | | |
| SW | 0.755* | 0.748* | 0.421NS | 0.502NS | 0.462NS | 0.633* | | | | |
| RW | 0.808** | 0.767* | 0.475NS | 0.569NS | 0.532NS | 0.670* | 0.994 | | | |
| SS | 0.621* | 0.601* | 0.266NS | 0.317NS | 0.256NS | 0.425NS | 0.891 | 0.871 | | |
| RS | 0.609* | 0.592NS | 0.255NS | 0.304NS | 0.242NS | 0.413NS | 0.883 | 0.862 | 0.974** | |
| SOC stock | 0.898** | 0.976** | 0.946** | 0.928** | 0.920** | 0.997** | 0.628 | 0.658 | 0.418NS | 0.407NS |

**Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed); NS: Nonsignificant correlation

BG: β Glucosidase, DHA: Dehydrogenase, URE: Urease, AP: Acid phosphatase, ALP: Alkaline phosphatase, FDA: Fluorescein Di-acetate, SW: lignin to cellulose ratio in wheat stubble, RW lignin to cellulose ratio in wheat root, SS: lignin to cellulose ratio in soybean stubble, RS: lignin to cellulose ratio in soybean root

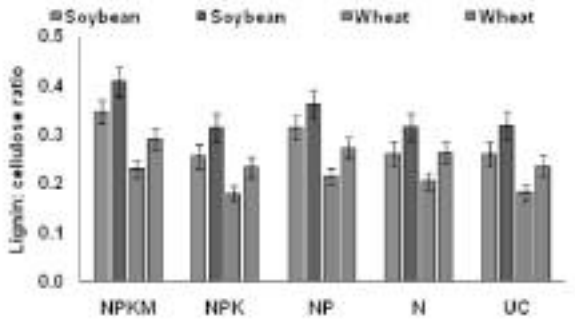


**Fig. - 2 : Lignin to cellulose ratio of stubble and roots of wheat and soybean as affected by 44 years of fertilization under a soybean-wheat cropping system in Vertisol. Error bars indicate LSD (P<0.05).**

**3.3 Effects of cellulose and Lignin ratio and SOC on enzyme activity**

Lignin and Cellulose are component of plant biomass and important factor for enzyme activity and SOC decay process. L: C ratio significantly improved under the NPK+FYM treatment but not by 100% NPK alone. Activity of β-glucosidase is directly concerned with quality and quantity of soil organic matter incorporation to soil. Though soil having high C: N ratio show less activity of this enzyme. β-glucosidase how greater activity in the soil having higher concentration of easily decomposable organic matter.

A correlation matrix (Table-2) showed the existence of a significant relationship (p=0.01) between soil enzyme activities and SOC.

Addition of FYM could enhance root biomass and root exudates (Lignin and Cellulose) and microbial biomass ( Arshal, Schtzer 1990). Equilibrium between C inputs from crop biomass and external organic amendments and out via heterotrophic microbial enzymatic decay controlled the SOC accumulation in soil.

The plot receiving 100% NPK+FYM show higher content of SOC could be due to (1) greater amount of organic inputs, (2) less proportionate microbial decomposition of lignin like substance over conventional practice.

SOC content is the treatment 100% NPK+FYM might be improved by supply of large amount of carbon through organic manure, root stubble, plant biomass and rhizpdeposition (Ghosh *et al* 2018a). SOC content was greater in surface layer and decreased with soil depth. This might be due to higher input of C in soil layer from higher plant root biomass and manure (Ghosh *et al* 2018b). In sub surface soil biological and enzyme activity reduced due to lower input of C and constraints root growth (Ghosh *et al* 2018a).

Quality of organic matter greatly influenced the DHA activity than quantity. Components of FYM get easily decomposed in the metabolism of soil micro-organisms. (Pancholy and Rice 1973). According to Mangalassey Kalaivanan and Philip (2019) dehydrogenase activity was higher in NPK+FYM treated plot as compared to mineral fertilized plots.

Acid and Alkaline phosphatase activity was significantly higher in NPK+FYM treated plot than NPK and fallow plots. Higher concentration of SOC stimulates the phosphatase activity in soil (Dodor and Tabatabai, 2003). The significant and linear correlation was found between SOC and phosphatase activity in the present investigation.

β- glucosidase predominantly originated from plants and animals. It catalyzes the hydrolysis and biodegradation of glucosidase present in plant

debris. (Martinez and Tabatabai, 1997). β-glucosidase take part in the last phase of the cellulose degradation process by hydrolyzing the cellobiose residue. (Gil-sotres *et al* 2005). Decomposition of crop residue resulted in the production of cellulose which is a substrate for β-glucosidase activity. Lopes *et al* (2011) revealed that due to application of organic manure NPK+FYM treatment contain higher amounts of cellulose and show higher enzymatic activity.

Urease enzyme catalyzes the hydrolysis of urea into $CO_2$ and $NH_3$, and plays a crucial role in the regulation of N supply to plants after urea fertilization (Piotrowska-Dlugosz and Charzynski, 2015). Chang Chung and Tsai (2007) reported that higher activity of urease enzyme under NPK+FYM treatment over NPK and fallow plot might be due to the presence of amino acid, amino sugar and protein like nitrogenous compounds and microbial population and higher amount of SOC in organic manure.

Bowen and Rovira (1999), Yang *et al* (2013) also reported the highest FDA dehydrogenase activity in the treatment receiving mineral fertilizer in combination with organic amendements. The higher oxidative functional activity might be due to higher carbon resources in the rhizosphere soil, which is considered as the driving force for microbial activity and density.

## CONCLUSIONS

The continuous application of INM showed describable impacts on extracellular enzyme and microbial activity in soil. Highest extracellular enzyme activities were observed in the soil amended with organic manures due to higher proliferation of soil microbes. From the results it could be concluded that soil fertility and soil health could be sustain and improved via integration of mineral fertilizer with organic amendments.

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# EFFECT OF DIFFERENT AGE OF COWS ON QUALITY OF THEIR MILK AT ORGANIZED DAIRY FARM OF ALLAHABAD, UTTER PRADESH

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**ABSTRACT**

**The present study was undertaken on "Effect of different age of cows on quality of their milk at organized dairy farm of Allahabad, Utter Pradesh" on twenty Holstein Friesian crossbred healthy cows from organized (SHIATS) dairy farm Allahabad Utter Pradesh. All cows were housed in tail to tail barn under similar management conditions. All sanitary precautions were undertaken to produce clean milk by dry full hand method of milking. Representative samples of 200 ml milk were collected at different age groups of cows viz. 3-5yr, 5-7yr and 7-9yr.Samples of fresh milk drawn from the udder were analyzed for fat, protein, lactose, ash, solid not fat (SNF), total solid (T.S.), water, acidity percent and specific gravity. It was summed up that Age had eloquent effect on Protein, total solids and water percentage and non- significant effect on fat, lactose, ash, solid not fat, sp. gravity and acidity percentage of different age of cow's milk at scientific (organized) dairy farm.**

***Keywords :*** *H.F. crossbred, different age of cows, quality of milk.*

## INTRODUCTION

India is a country with diversified agro climatic condition. Being an agriculture country over ¾ of Indian people is involved in agricultural operation for about 8 to 9 months of the year. To the majority and small farmer and land labours it is necessary to rear a cow, buffalo, heifer, calf or other livestock as a source of extra income. They keep milk giving buffalo or cow which is additional source of daily income.

Crop husbandry and Animal husbandry are dependent on each other in India mainly due to small land holdings of greater number of the farmers. Bullocks and buffaloes are main draft animals employed in different agricultural operations, such as ploughing, planking, threshing, transportation etc. Females of these bovines are a source of milk, a valuable complete protein of animal origin and mail calves born are mostly used for traction purposes and urine of these animals are converted to valuable manure by composting. FYM is a good quality source of NPK.

Prevention of food adulteration (PFA) rules, milk is white lacteal mammary discharge obtained from the complete milking of a healthy milch animal without either addition there to or extraction there from. Free from colostrums, contains all the nutrients essential for growth i.e. water, fat, proteins, lactose, minerals vitamins and ash, recognized as a vegetarian food since ancient times and all Indians consume milk and its products without reticence. It is especially beneficial for young ones as it has the ingredients for growth and development particularly a sufficient concentration of quality protein, mineral and vitamins. Especially vitamin A, riboflavin and vitamin B12 and is also the best natural supply of

calcium in the best available from (Pathak 2003.)

Milk and its product are superb source of vital nutrients. It is assumed as nature's nearly perfect nutrients food. Milk proteins offer a high class animal protein in go on diet. Milk fat fractions are being recognized to posses remarkable anti cancer properties. Mineral and vitamin contents of milk contribute to significant human nutrition. Calcium is needed for protection against brittle bones in the latter part of life. It is now being considered an essential for prevention from blood pressure in protecting colon from cancer. Milk and milk extract products from dairy farm animals are edible and easy to digest therefore important human food.

## MATERIALS AND METHODS

The present experiment on "Effect of different age of cows on quality of their milk at organized dairy farm of Allahabad, Utter Pradesh" on Twenty Holstein Friesian crossbred healthy cows from organized (SHIATS) dairy farm Allahabad, Utter Pradesh. The cows at organized dairy farm were subjected to Californian mastitis test at organized dairy farm with negative test were selected for the study. All experimental animals were housed in a tail to tail barn and managed under more or less similar managemental conditions. Sanitary precautions like clipping of long hair at udder and flank, grooming, washing of hind quarters, wiping udder with towel soaked in 2% Dettol solution, tying tail with legs etc. were taken care prior to collection of milk samples. Cows were milked by full and dry hand method of milking. Two streams of fore milk from each quarter of udder were discarded and a sample of 200 ml milk was collected directly into sterilized conical flasks and plugged immediately. Milk sample were brought to laboratory for chemical analysis and the fat, protein, lactose, water, ash, solid not fat (SNF), total solid (TS), Sp. gr. and acidity percent was determined as per AOAC (1995).

**Factor for study;**

**Age of cows:**

a) 3-5 years (b) 5-7 years (c) 7-9 years

**Parameters of Study:**

**Parameters determined in milk were as follows:**

(i) Fat percent
(ii) Protein percent
(iii) Lactose percent
(iv) Ash percent
(v) Solid not fat(SNF) percent
(vi) Total solid(TS) percent
(vii) Water percent
(viii) Acidity percent
(ix) Specific gravity (sp. gr.) percent

## RESULTS AND DISCUSSION

**Fat percent in milk at organized dairy farm:**

Highest mean fat per cent was recorded as 4.00 in milk of cows of 5-7 years followed by 3.73 in milk of cows in 7-9 years and 3.70 in milk of cows in 3-5 years at organized dairy farm. The differences in these values were non -significant at organized dairy farm.

**Protein percent in milk at organized dairy farm:**

Highest mean protein per cent was recorded as 3.49 in milk of cows of 5-7 years followed by 3.36 in milk of cows in 7-9 years and 3.25 in milk of cows in 3-5 years at organized dairy farms. The differences in these values were significant at organized dairy farms

**Lactose percent in milk at organized dairy farm:**

Highest mean lactose per cent was recorded as 4.81 in milk of cows of 3-5 years followed by 4.79 in milk of cows in 7-9 years and 4.72 in milk of cows in 5-7years at organized dairy farms. The differences in these values were non-significant at organized dairy farms

**Ash per cent in milk at organized dairy farm:**

Highest mean ash per cent was recorded as 0.692 in milk of cows of 7-9 years followed by 0.690

in milk of cows in 3-5 years and 0.690 in milk of cows in 5-7 years at organized dairy farm. The differences in these values were non-significant at organized dairy farm.

**T.S percent in milk at organized dairy farm:**

Highest mean T.S per cent was recorded as 12.90 in milk of cows of 5-7 years followed by 12.58 in milk of cows in 7-9 years and 12.45 in milk of cows in 3-5 years at organized dairy farm. The differences in these values were significant at organized dairy farm.

**S.N.F. percent in milk at organized dairy farm:**

Highest mean S.N.F per cent was recorded as 8.90 in milk of cows of 5-7 years followed by 8.85 in milk of cows in 7-9 years and 8.75 in milk of cows in 3-5 years at organized dairy farm. The differences in these values were non-significant at organized dairy farm.

**Water percent in raw milk at organized dairy farm:**

Highest mean Water per cent was recorded as 87.55 in milk of cows of 3-5 years followed by 87.42 in milk of cows in 7-9 years and 87.10 in milk of cows in 5-7 years at organized dairy farms. The differences in these values were significant at organized dairy farm.

**Sp. gravity in milk at organized dairy farm:**

Highest mean specific gravity was recorded as 1.031in milk of cows of 5-7 years followed by 1.030 in milk of cows in 3-5 years and 1.030 in milk of cows in 7-9 years at organized dairy farms. The differences in these values were non-significant at both organized and unorganized dairy farm.

**Acidity percent in milk at organized dairy farm:**

Highest mean acidity per cent was recorded as 0.135 in milk of cows of 7-9 years followed by 0.134 in milk of cows in 5-7 years and 0.131in milk of cows in 3-5 years at organized dairy farm. The differences in these values were non-significant at organized dairy farm.

**Table - 1 : Mean values of parameters in different age of cows at organized dairy farm**

| Parameters | Organized dairy farm | | | |
|---|---|---|---|---|
| | 3-5yrs | 5-7yrs | 7-9yrs | Results |
| Fat Percent | 3.70 | 4.00 | 3.73 | NS |
| Protein Percent | 3.25 | 3.49 | 3.36 | S |
| Lactose Percent | 4.81 | 4.72 | 4.79 | NS |
| Ash Percent | 0.690 | 0.690 | 0.692 | NS |
| T.S. Percent | 12.45 | 12.90 | 12.58 | S |
| S.N.F. Percent | 8.75 | 8.90 | 8.85 | NS |
| Water Percent | 87.55 | 87.10 | 87.42 | S |
| Sp. Gravity | 1.030 | 1.031 | 1.030 | NS |
| Acidity Percent | 0.131 | 0.134 | 0.135 | NS |

## CONCLUSION

It was summed up that Age had eloquent effect on Protein, total solids and water percentage and non- significant effect on fat, lactose, ash, solid not fat, sp. gravity and acidity percentage of different age of cow's milk at scientific (organized) dairy farm.

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# NEW RECORD OF CASSIDINAE (COLEOPTERA: CHRYSOMELIDAE) FROM DUMNA NATURE PARK MADHYA PRADESH

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**ABSTRACT**

**This paper represents some records of Cassidinae Genus Aspidomorpha, Along with six months sampling about 15 specimens were collected and three new records were identified belonging to above said genera of Cassidinae from Madhya Pradesh, India.**

***Keywords :*** *Cassidinae, aspidomorpha, new records*

## INTRODUCTION

Dumna Nature Reserve Park is an ecotourism site open to the public located in the Jabalpur district of Madhya Pradesh. It includes a dam, forests, and wildlife in a 1058-hectare area.

Chrysomelidae or leaf beetles are comprising one of the largest Insect families with more than 38,000 species arranged in approximately 2,500 genera and 11 subfamilies (Lawrence 1982; Seeno and Wilcox 1982; Reid 1995 and 2000). Chandra and Kushwaha, 2014 reported seven species from Madhya Pradesh.

## MATERIALS AND METHODS

While undertaking the surveys of various parts of Madhya Pradesh, some impressive specimen of Cassidinae was also collected, which was later identified. These specimens were pinned and identified with the help of literature.

**Systematic Account**

Class: Insecta
Order: Coleoptera
Superfamily: Chrysomeloidea
Family: Chrysomelidae
Subfamily: Cassidinae
Tribe: Aspidimorphini

**Aspidomorpha furcata (Thunberg, 1789)**

1789. Cassida furcata Thunberg, Nov. Ins. Spec, 5:87.

2001. Aspidomorpha furcata Kimoto, Bull. Kitakyushu Mus. Nat. Hist., 20: 70

Material examined: Madhya Pradesh, Dumna Nature Park, Butterfly Park, Cahuma, 11.v.2018, (12 ex), Coll. Shivam Dubey.

Distribution: India: Madhya Pradesh, Chhattisgarh, Tamil Nadu, Karnataka, Kerala, Maharashtra, West Bengal, Sikkim, Assam and Meghalaya.

Elsewhere: Nepal, Sri Lanka, Myanmar, Thailand Vietnam, S. China, Taiwan, Japan, Korea, Siberia, Malaya, Sudan.

**Aspidomorpha miliaris (Fabricius, 1775)**

1775. Cassida miliaris Fabricius, Syst. Ent.: 91

2000. Aspidomorpha miliaris Medvedev, Stuttg.

Beit. Naturk.. ser. A. 616: 25.

**Material examined:** Madhya Pradesh, Dumna Nature Park, Butterfly Park, Cahuma, 11.vi.2018, (12 ex), Coll. Shivam Dubey.

Distribution: India: Madhya Pradesh, Sikkim, Karnataka, West Bengal, Jharkhand, Arunanchal Pradesh, Maharashtra and.

Elsewhere: Bangladesh, Myanmar, China, Hong Kong, Indonesia, Malaysia, Nepal, New Guinea, Philippines, Thailand, Vietnam.

**Aspidimorpha sanctaecrucis (Fabricius, 1792)**

1792. Cassida sanctaecurcis Fahricius, Ent. Syst., 4 (App.): 446

1970. Aspidomorpha sanctaecurcis Kimoto, Spec. Bull. Lep. Soc. Japan. 4: 171

Material examined: Madhya Pradesh, Dumna Nature Park, Butterfly Park, Cahuma, 1.vii.2018, (2 ex), Coll. Shivam Dubey.

Distribution: Madhya Pradesh. Assam, Sikkim, Kerala, Tamil Nadu, Maharashtra, Karnataka, Orissa, Arunanchal Pradesh and West Bengal. Elsewhere: Myanmar, China.

## RESULTS AND DISCUSSION

While working on an unidentified collection of Coleoptera fauna of Dumna Nature Park, Madhya Pradesh, an additional three new records of Cassidinae were recorded from Madhya Pradesh, India.

## ACKNOWLEDGEMENT

The authors are thankful to authorities of Dumna Nature Park, Jabalpur for providing necessary facilities and encouragement.

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# EFFECT OF DIFFERENT BODY WEIGHT OF COWS ON QUALITY OF THEIR MILK AT ORGANIZED DAIRY FARM OF ALLAHABAD, U.P.

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Received : 19.09.2019 Accepted : 29.10.2019

**ABSTRACT**

**The present study was undertaken on "Effect of different body weight of cows on quality of their milk at organized dairy farm of Allahabad, Utter Pradesh" on twenty Holstein Friesian crossbred healthy cows from organized (SHIATS) dairy farm Allahabad Utter Pradesh. All cows were housed in tail to tail barn under similar management conditions. All sanitary precautions were undertaken to produce clean milk by dry full hand method of milking. Representative samples of 200 ml milk were collected at different body weight groups of cows viz. 250-300kg, 301-400 and 401-500kg. Samples of fresh milk drawn from the udder were analyzed for fat, protein, lactose, ash, solid not fat (SNF), total solid (T.S.), water, acidity percent and specific gravity. It was summed up that body weight of cows had eloquent effect on fat, total Solids and water percentage and non-significant effect on protein, lactose, ash, solid not fat, specific gravity and acidity percentage of different body weight of cow's milk at scientific (organized) dairy farm.**

***Keywords:*** *H.F. crossbred, different body weight of cows, quality of milk.*

## INTRODUCTION

Crop husbandry and Animal husbandry are dependent on each other in India mainly due to small land holdings of greater number of the farmers. Bullocks and buffaloes are main draft animals employed in different agricultural operations, such as ploughing, planking, threshing, transportation etc. Females of these bovines are a source of milk, a valuable complete protein of animal origin and mail calves born are mostly used for traction purposes and urine of these animals are converted to valuable manure by composting. FYM is a good quality source of NPK.

Livestock play an important role in Indian agriculture economy & plays a multifaceted role in providing livelihood support to population of rural India. Livestock division apart from contribution to countrywide market provides employment opportunities, social and financial creation. Even though it has been fount a deficit in development of livestock output in 1990s, the increasing rate of animal husbandry was much more than crop husbandry. The contribution of livestock sector in agriculture in the economy was 17.3% during 1980-81 increased to 26.9% in 2007-08.The contribution of animal husbandry to national GDP has been around 5.5% over the year despite prominent variation experiment in the role of crop sector in

national GDP, which is representing the stability of livestock sector.

"Failure is never final and success never ending". Former Chairman of N.D.D.B., Varghese Kurein made a statement perfectly to describe the current status of dairy production in India. As on today even the weakest connection in the chain of dairy industry is the 'Milk' from milk producer to end user. This needed to be addressed by introducing concept of milk production at the village level. It is encouraging that the concept of clean milk production have recently gained momentum due to first deterioration of milk quality from producer to dairy stock and needed to preserve worth of milk for better quality. It has become an imperative for Indian dairy production to produce clean milk for safe quality. Milk and milk products to complete in national and international market in the WTO era (Sohrab, 2005)

Milk and its product are superb source of vital nutrients. It is assumed as nature's nearly perfect nutrients food. Milk proteins offer a high class animal protein in go on diet. Milk fat fractions are being recognized to posses remarkable anti cancer properties. Mineral and vitamin contents of milk contribute to significant human nutrition. Calcium is needed for protection against brittle bones in the latter part of life. It is now being considered an essential for prevention from blood pressure in protecting colon from cancer. Milk and milk extract products from dairy farm animals are edible and easy to digest therefore important human food.

## MATERIALS AND METHODS

The present experiment on "Effect of different body weight of cows on quality of their milk at organized dairy farm of Allahabad, Utter Pradesh" on Twenty Holstein Friesian crossbred healthy cows from organized (SHIATS) dairy farm Allahabad, Utter Pradesh. The cows at organized dairy farm were subjected to Californian mastitis test at organized dairy farm with negative test were selected for the study. All experimental animals were housed in a tail to tail barn and managed under more or less similar managemental conditions. Sanitary precautions like clipping of long hair at udder and flank, grooming, washing of hind quarters, wiping udder with towel soaked in 2% Dettol solution, tying tail with legs etc. were taken care prior to collection of milk samples. Cows were milked by full and dry hand method of milking. Two streams of fore milk from each quarter of udder were discarded and a sample of 200 ml milk was collected directly into sterilized conical flasks and plugged immediately. Milk sample were brought to laboratory for chemical analysis and the fat, protein, lactose, water, ash, solid not fat (SNF), total solid (TS), Sp. gr. and acidity percent was determined as per AOAC (1995).

**Factor of treatment**

**Body weight groups:**

a) 250-300kg.
b) 301-400kg.
c) 401-500kg.

**Parameters of Study:**

**Parameters determined in milk were as follows:**

(i) Fat percent
(ii) Protein percent
(iii) Lactose percent
(iv) Ash percent
(v) Solid not fat(SNF) percent
(vi) Total solid(TS) percent
(vii) Water percent
(viii) Acidity percent
(ix) Specific gravity (sp. gr.) percent

## RESULTS AND DISCUSSION

**Fat percent in milk at organized dairy farm:**

Highest mean fat per cent was recorded as

4.05 in milk of cows of 301-400 kg body weight followed by 3.68 in milk of cows in 401-500 kg and 3.65 in milk of cows in 250-300 kg at organized dairy farms. The differences in these values were significant at organized dairy farm.

**Protein percent in milk at organized dairy farm:**

Highest mean protein per cent was recorded as 3.44 in milk of cows of 301-400 kg body weight followed by 3.35 in milk of cows in 401-500 kg and 3.28 in milk of cows in 250-300 kg at organized dairy farms. The differences in these values were non-significant at organized and dairy farm.

**Lactose percent in milk at organized dairy farm:**

Highest mean lactose per cent was recorded as 4.84 in milk of cows of 250-300 kg body weight followed by 4.76 in milk of cows in 401-500 kg and 4.73 in milk of cows in 301-400 kg at organized dairy farms. The differences in these values were non-significant at organized dairy farm.

**Ash percent in milk at organized dairy farm:**

Highest mean ash per cent was recorded as 0.70 in milk of cows of 401-500 kg body weight followed by 0.69 in milk of cows in 250-300 kg and 0.69 in milk of cows in 301-400 kg at organized dairy farms. The differences in these values were non-significant at organized and dairy farm.

**T.S percent in milk at organized dairy farm:**

Highest mean T.S per cent was recorded as 12.90 in milk of cows of 301-400 kg body weight followed by 12.48 in milk of cows in 400-500 kg and 12.46 in milk of cows in 250-300 kg at organized dairy farms. The differences in these values were significant at organized dairy farm.

**S.N.F. percent in milk at organized dairy farm:**

Highest mean S.N.F per cent was recorded as 8.85 in milk of cows of 301-400 kg body weight followed by 8.81 in milk of cows in 250-300 kg and 8.80 in milk of cows in 401-500 kg at organized dairy farms. The differences in these values were non-significant at organized dairy farm.

**Water percent in milk at organized dairy farm:**

Highest mean water per cent was recorded as 87.54 in milk of cows of 250-300 kg body weight followed by 87.52 in milk of cows in 401-500 kg and 87.10 in milk of cows in 301-400 kg at organized dairy farms. The differences in these values were

**Table -1 : Mean values of parameters in milk in different body weight groups of cows at organized dairy farm**

| Mean values of parameters in different body weight of cows at organized dairy farm | | | | |
|---|---|---|---|---|
| **Parameters** | **Organized dairy farm** | | | |
| | **250-300 Kg** | **300-400 Kg** | **400-500 Kg** | **Results** |
| Fat Percent | 3.65 | 4.05 | 3.68 | S |
| Protein Percent | 3.28 | 3.44 | 3.35 | NS |
| Lactose Percent | 4.84 | 4.73 | 4.76 | NS |
| Ash Percent | 0.69 | 0.69 | 0.70 | NS |
| T.S. Percent | 12.46 | 12.90 | 12.48 | S |
| S.N.F. Percent | 8.81 | 8.85 | 8.80 | NS |
| Water Percent | 87.54 | 87.10 | 87.52 | S |
| Sp. Gravity | 1.031 | 1.03 | 1.03 | NS |
| Acidity Percent | 0.13 | 0.13 | 0.14 | NS |

significant at organized dairy farm.

**Specific gravity in milk at organized dairy farm:**

Highest mean specific gravity was recorded as 1.031 in milk of cows of 250-300 kg body weight followed by 1.030 in milk of cows in 301-400 kg and 1.030 in milk of cows in 401-500 kg at organized dairy farms. The differences in these values were non-significant at organized dairy farm.

**Acidity percent in milk at organized dairy farm:**

Highest mean acidity per cent was recorded as 0.14 in milk of cows of 401-500 kg body weight followed by 0.13 in milk of cows in 250-300 kg and 0.13 in milk of cows in 301-400 kg at organized dairy farms. The differences in these values were non-significant at organized dairy farm.

## CONCLUSION

It was summed up that body weight of cows had eloquent effect on fat, total Solids and water percentage and non- significant effect on protein, lactose, ash, solid not fat, specific gravity and acidity percentage of different body weight of cow's milk at scientific (organized) dairy farm.

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# OCCURRENCE OF *PETALOCHIRUS BURMANUS* DISTANT, 1903 FAMILY REDUVIIDAE FIRST TIME FROM CENTRAL INDIA

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**ABSTRACT**

**Present paper deals with Petalochirus burmanus Distant, 1903; rare diurnal species of Genus Petalocheirus Burmeister, 1843, of family Reduviidae; subfamily Salyavatinae. The species described here is reported for the first time from Madhya Pradesh, India.**

***Keywords :*** *Petalocheirus burmeister, 1843, subfamily salyavatinae, rare species, India.*

## INTRODUCTION

Reduviidae is the largest family of terrestrial Hemipterans, consisting of 6250 species world-wide and subspecies spread across 913 genera and 25 subfamilies (Maldonado, 1990). Reduviids are abundant, occur globally and are prodigious predators. Thus, they are referred to as assassin bugs. Genus Petalocheirus Burmeister, 1843 was placed in subfamily Salyavatinae (Amyot and Serville, 1843) of family Reduviidae. The Salyavatinae is a small subfamily of medium-sized, mostly old world assassin bugs, with only 15 genera and 99 species (Maldonado 1990). Little information is available on these unusual, often spined bugs. This family is characterised by a relatively small head, somewhat globular, constricted just behind eyes; neck short: eyes relatively small; antennae sometimes apparently 3-segmented (e.g. in Salyavata), inserted on prominent, anteriorly projecting tubercles; labium moderately long. Weakly curving; pronotum, scutellum, and abdomen often with slender, strongly acuminate spines; fore and middle tibiae with fossula spongiosa; fore tarsi two segmented, middle and hind tarsi three segmented; membrane with two cells; nymphs with three dorsal abdominal glands.

Earlier work on genus Petalocheirus Burmeister, 1843 was done by Distant, 1902, reported Petalocheirus brachialis Stal, 1858 and Petalocheirus indicus Reuter, 1887 from India and Petalocheirus malayus Stal, 1902, Petalochirus burmanus Distant from Tripura and Petalocheirus Myanmarnus Distant, 1903 included in the Reduviidae fauna of India by Ambrose, 2006 & Biswas and Mitra, 2011 respectively.

## MATERIALS AND METHODS

The present paper describes the first occurrence of Petalochirus burmanus Distant, 1903, from Madhya Pradesh, India. It is diurnal and scarce species of this genus.

**Systematic Account:**

Order: Hemiptera

Suborder: Herroptera

Family: Reduviidae

Subfamily: Salyavatinae Amyot and Serville, 1843

Genus: Petalocheirus Burmeister, 1835

**Petalochirus burmanus Distant, 1903**

1902. Petalochirus burmanus Distant, Fauna Brit. India, Rhynchota, 2: 242.

1903. Petalochirus burmanus Distant, Ann. Soc. Ent. Belg. 55.

Material examined: Madhya Pradesh, Dumna Nature Park, 27.xi.2017, Coll. Shivam Dubey.

**Diagnostic character:** Body brownish ochraceous; hemelytra distinctly mottled with luteous with a small discal fuscous spot. Connexivum light greenish yellow, with black spots. The ventral view is blackish and hairy. Anterior and posterior tibiae & femora with annulations and castaneous; Antennae black with red tinge; first joint with central annulation, last joint fragile and densely pilose. Head sulcated between the eyes; anterior angels of pronotum spinous suberect and golden yellow; posterior angles obliquely erect and dark brownish grey. Scutellum with three distinct erect spines two on basal portion black in colour and one of them on apical dark brownish. Connexivum with spines which are directly backward fuscous in colour. Anterior tibae broadly dilated. Posterior and middle femora with black spines on its apex. (Plate 1- Fig.1 Dorsal view and Fig. 2 Ventral view.)

Plate 1

Fig. 1 *Petalochirus burmanus* Distant

Fig. 2 *Petalochirus burmanus* Distant

Distribution: India: Madhya Pradesh, Andhra Pradesh and Tripura.

Elsewhere: Myanmar.

Measurements: Body length- 16 cm; Width between pronotal angles-5 cm; Length of antenna 10 cm.

## RESULTS AND DISCUSSIONS

The present investigation describes the first record of Petalochirus burmanus Distant, 1903 family Reduviidae from Madhya Pradesh, India, which was formally known from Tripura (Biswas and Ghosh, 2000, more investigation should be needed at day time for more findings of subfamily Salyavatinae from Madhya Pradesh India.

## ACKNOWLEDGEMENT

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# AN ENQUIRY INTO THE SOCIO-ECONOMIC STATUS OF RAINFED COMMUNITIES IN BUNDELKHAND REGION OF U.P. STATE

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**ABSTRACT**

**An attempt has been made to identify the socio-economic status of rainfed communities of rural area of Bundelkhand region of Uttar Pradesh, rainfed area contribute about one half of India's production of coarse grain, cereals, pulses and oilseeds. Dryland agriculture is characterized by wide spatio-temporal variation in the productivity of crops due to uncertainty and high fluctuations n agro-climatic conditions. The poor among the farmers in the dryland communities suffer from double handicap. Firstly they are located in a resource environment, which does not readily yielded now and remunerative economic opportunities. Secondly, with a weak land base, it is unlikely that they would become viable by depending on agriculture alone. It could be seen that the estimated average value of index of standard of living was lowest in category II households, which was 34 whereas it was higher in category I households, followed by category III which accounted to 62, and 46, respectively. Also the average value of index of economic indicator showed a similar trend. However, the average index of social factors was high in the case of category I households (50), followed by category II households (48) and it was lowest in households of category III. The Index of deprivation for the selected non-monetary/social variable had been computed for each of the individuals households. It could be seen that around 80 per cent of the category I households lay in a not deprived state and the remaining households were legs deprived.**

**The loss deprived households had an index of deprivation value ranging between 4 and 7 which account to 56.25 per cent of category II households and 55.14 per cent of category III households, respectively were found to be moderately deprived with ID values ranging between 8 and 11. It is also seen that 19.67 per cent of the total sample households were moderately deprived of the selected social indicator and 46 per cent of them were less deprived, whereas 34.33 per cent of the total households were not deprive. The results show that the specified logit model was significant at ten per cent level of probability. The level of count R2 obtained was 0.87, which indicated the good predictive ability of the model. The estimation yielder the expected signs for the coefficient of all the independent variables except social status. The results indicated that literacy percentage, category, man-days of employment, percentage of earners in the households and income of the households were negative and significant slope coefficient would decrease the probability of the respondent being poor by their appropriate percentage.**

***Keywords :*** *Socio, economics, rainfed communities and rural area.*

## INTRODUCTION

Rural Poverty in Uttar Pradesh is concentrated among those with marginal landholdings and department on rainfed agriculture. Dry land area contribute about one half India's production of coarse grain, cereals, pulses, oilseeds and cotton. Dry land agriculture is characterized by wide spatio-temporal variations in the productivity of crops due to uncertainty and high fluctuations in Agro-climatic conditions. The poor among the farmers in the dry land communities suffer from double handicap, firstly, they are located in a resource environment, which does not readily yield new and remunerative economic opportunities, secondly, with a weak land base, and it is unlikely that they would become viable by depending on agriculture done. Thus, the households in rural areas are found to be in low standard of living. Scheduled castes and tribes are highly represented among the poor. This is certainly due in part to their owning less land, and of lower quality, as well as other assets than households which are not of the scheduled castes. Important challenges in the non-income dimensions of poverty also remain. There are gender, caste, inter district and urban rural disparities. The standard of living of a society, otherwise, said to be its well being and hence, its poverty which is a manifestation of insufficient well-being depends on both monetary and non monetary variables, income as the sole indicator of standard of living inappropriate and should be supplemented by other attributes or variables by housing, literacy, type of agricultural land possessed and so on. Hence, this paper attempt to study the socio-economic status of the rural households in rainfed areas.

The specific objectives of the study are (i) to estimate the indices of levels of living of different types of households in rainfed area (ii) To identify the factors influencing the households being poor.

## MATERIALS AND METHODS

A three-stage stratified random sampling method, 300 households from ten villages each of Tenduwari and Jasara Block from dry farming areas of Uttar Pradesh were selected for the study. All the sample households were interviewed personally to collect to required primary data. The household enquiry included details on their socio-economic status including employment level, income and food consumption pattern, income spent on various food items, clothing, shelter, education, health, festivals, recreations and other miscellaneous items, and also access to basic amenities like safe drinking water, sanitation, school, transport, market facilities, communication and recreation facilities.

The 'Z-Test' analysis undertaken to find the homogeneity of sample mean indicated that the sample is homogenous of the population. However, there existed high variations with in the sample. A comparative study of the households on their standard of living was attempted of using "composite index of standard of living". Considering the major aspects of levels of living of the population.

## ANALYTICAL FRAMEWORK

### Composite index of standard of living:

Composite index of standard of living was computed for each house had combining the social and economic indicators using the scoring technique (Singh and Chand 2000 and Puhazhendhi and Satyasi 2000).

The social indicators included the availability of electricity in the households, easy access to medical facilities, educational institutions, ransport facilities, communications, recreation and market facilities, availability of proper sanitation with in the house and access to safe drinking water. The economic indicators included the value of

assets, income, consumption expenditure, savings and borrowings. The different indices were calculated as follows.

**Index of social indication of h-th household (Sn):**

$\Sigma Sn/\Sigma Sn(max)$

**Index of economic indicators with household (Eh):**

$\Sigma Ej/E_{k(max)}$

**Composite index of standard of living of h-th household (C1sL-h):**

$W_1 Sh + W_2 Eh$

Where, Si and Ej represent i-th social and j-th economic indicators, respectively.

Si(max) Ej (max) are the maximum scores for i-th social indicator and j-th economic indicator.

Weight $W_1$ is given by $\Sigma Si(max)/(\Sigma Si(max) + \Sigma Ek(max)$ and $W_2$ is $(1 - W1=)$

**Index of deprivation (ID):**

The indicators, which have shown significant difference between the poor and non-poor in their levels of living, were only considered in computing the deprivation index. The justification for selecting the above set of indicators is that computed targeting errors were found to be lower in any other combination of indicators. However, alternative methods may be developed with a new set of characteristic or giving weights to the indicators considered in the present study.

Factors influencing the households being poor:

The logit model in this study postulates that Pi the probability that a respondent i is poor, is a function of index variable, Zi summarizing a set of the individual attributes. Hence, let us consider the following representation of a household being poor.

$$Pi = E(Y = 1/Xi) = \frac{1}{1 + e - (\beta_2 + \beta_2 + X_1)}$$

Where, e is familiar of the natural logaritham. Now, let equation is rewritten as:-

$$P_i = \frac{1}{1 + e\, z_1}$$

Where $z_1 = \beta_1 + \beta_2 xi$

**Estimation of the logit model:**

For estimation purposes, equation can be written as follows:

$$L_i = n\left(\frac{Pi}{1 - P_1}\right) = \beta_1 + \beta_2 X_1 + U_1$$

To estimate the model, we need, apart from Xi, the values of the logit L0, but now we run into some difficulties. If we have data on individual respondents, $P_i = 1$, if the respondent is poor and $P_i =$ o, if the respondent is non-poor. But if put there values directly into the logit Li, we obtain:

$l_i = l_n (1/0)$ (if the respondent is poor

$l_i = l_n (1/0)$ (if the respondent is non-poor

The index variable P; indicating whether the respondent is poor or non-poor has been expressed as a linear function of the independent variables. Thus the logit regression model has been specified as follows:

$L_i = a_1 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + U_i$

Where,

$X_1$ = Age of the respondent in years,

$X_2$ = Percentage of the literates in the household,

$X_3$ = Category of respondent if category 11, otherwise

$X_4$ = Social status of the households, 1 scheduled caste, 0, otherwise

$X_5$ = Percentage of earners in the household.

$X_6$ = Annual income of the household in rupees.

$X_7$ = Man days of employment of the household.

$\beta_{is}$ = Parameters to be estimated.

$U_i$ = Error term

**RESULTS AND DISCUSSION**

A stated in the objective of this study the standard of living of the sample households was analysed using an aggregate measure encompassing

social as well as economic aspects. The composite index of standard of living has been worked out by assigning scores to the identified economic variables and social variables, index of economic indicators and index of social indicators were also analysed separated for each of the three categories for households.

It could be seen from table that the estimated average value of index of standard of living was lowest in category II households, which was 34, whereas it was higher in category I households, followed by category III which accounted to 62 and 46 respectively. Also, the average value of index of social factors was high in the case of category I households (50), followed by category II households (48) and it was lowest in households of category III.

The distribution of households according to the value of composite index clearly indicated that about 50 per cent of the category I households were found to be distribution in the index value of above 60 and 38.27 per cent of them were distributed in an index value ranging between 40 and 60. In case of category III households, an almost similar obtained i.e. around 45 per cent of them were distributed in the index range of 20 to 40 in the case of category II households only 16 per cent of the sample households were distributed in the index value ranging between 40 and 80. A good majority of about 80 per cent of these households were having a lower index of standard of living of 20-40.

With regards to the index of economic indicator also only 11 per cent of category II households were distributed in the index of 40-80. However, around 63 per cent of these households were distributed in the index value of between 40 and 80 with respect to the index of social indicator. It could also be noted that around 59 per cent of the category.

I household were distributed in the index value of between 60 and above and the remaining households lay value the index of 60. the category III households were more pronounced in the economic aspects than the social aspects, that it could be concluded that the category II households were found to be the disadvantages category, whose standard of living was lower as compared to the other two categories of the sample households in to be economic & social aspects.

**Index of deprivation (ID):**

The index of deprivation for the selected non monetary/ social variables had been computed for each of the individual household (per cent).

Theoretically, the ID value ranges between 0 and 15. The percentage distribution of households by the level of deprivation categories as not deprived

**Table - 1 : Composite index of standard of living for the sample households**

| Index | Social index | | | Economic index | | | Composite index | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cultivators | Agril. labourer | Other workers | Cultivator | Agril. labourer | Other workers | Cultivator | Agril. labourer | Other workers |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Up to 20 | - | - | - | - | 11.61 | 8.41 | - | 3.57 | 3.74 |
| 21-40 | 35.80 | 35.72 | 47.64 | 12.35 | 76.79 | 47.66 | 11.11 | 76.46 | 19.64 |
| 41-60 | 37.04 | 47.32 | 32.71 | 28.69 | 8.03 | 17.76 | 38.27 | 14.29 | 23.36 |
| 61-80 | 27.16 | 16.96 | 19.63 | 33.33 | 3.57 | 14.95 | 40.74 | 2.68 | 20.56 |
| 81-100 | - | - | - | 25.93 | - | 11.21 | 9.88 | - | 2.80 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Av. index | 50 | 48 | 45 | 65 | 30 | 46 | 62 | 34 | 46 |

less deprived, moderately deprived and the most deprived is presented in Table 2.

**Table - 2 : Distribution of household by level of deprivation**

| S. No. | ID | Category I | Category II | Category III | All samples |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1. | Not deprived (0-3) | 65 (80.25) | - | 38 (35.51) | 103 (34.33) |
| 2. | Less deprived (4-7) | 16 (19.75) | 63 (56.23) | 59 (55.14) | 138 (46.00) |
| 3. | Moderately deprived (8-11) | - | 49 (43.75) | 10 (9.35) | 59 (19.67) |
| 4. | Most deprived (12-15) | - | - | - | - |
| | Total | 81 (100.00) | 112 (100.00) | 107 (100.00) | 300 (100.00) |

(Numbers)

Note: Figure in parenthesis represent percentage to deprivation respective total

It could be seen from Table 2 that around 80 per cent of the category I household lay in a not deprived state and the remaining households were less deprived. The less deprived households had an ID value ranging between 4 and 7, which accounted to 56.25 per cent of category II households and 55.a4 per cent of category III households, respectively were found to the moderately deprived with ID values ranging between 8 and 11. It is also seen that 19.67 per cent of the selected social indicators does persists among the sample households. Thus, it could be informed that the sample households were found to be deprived based on the social indicators, economic indicators and housing indicators in sum the category II households were more deprived than the other two categories of sample households.

**Factors influencing a households being poor:**

The logit framework has postulated that the probability of a household being poor was dependent on the socio-economic characteristics of the households. The maximum livelihood estimate of the coefficient of the logit model for the respondent is presented in Table 3.

**Table - 3 : Mile coefficient for logit model**

| S. No. | Variable | Logit mile coefficient | Standard error |
|---|---|---|---|
| 1. | Intercept | 4.1547*** | 1.3505 |
| 2. | Age | 0.0019*** | 0.0059 |
| 3. | Percentage of literates | 0.0857* | 0.0534 |
| 4. | Category | 0.9344* | 0.4883 |
| 5. | Social status | 0.3958 | 0.4387 |
| 6. | Percentage of economic | 0.3971* | 0.2150 |
| 7. | Income | 0.0484** | 0.234 |
| 8. | Man-days of employment | 0.0027* | 0.0015 |
| 9. | Count $R^2$ | 0.87 | |
| 10. | Number of observations | 300 | |

*, ** and *** at 10, 5 and 1 per cent level respectively

The results show that the specified logit model was significant at ten per cent level of probability. The level of count R2 obtained was 0.87, which indicated the good predictive ability of

the model. The estimation yielded the expected signs for the social status. The results indicated that literacy percentage, category, man-days of employment, percentage of earners in the household and income of the household were negative and significant. Thus, it could be improved that one unit change in the negative and significant slope coefficient would decrease the probability of the respondent being poor by their appropriate percentages. The coefficient of the independent variables age is positive and significant and indicated that the change in age would increase the probability of the respondent to be poor. The coefficient of the independent variable, Social status was positive indicating that the probability of SC/ST respondents to be non-poor. However, this coefficient is not significant, and hence the social status of the respondent could not influence their probability of being poor. Also, the case is true among the sample households. The non-SC/ST households were also found to be poor. He results of this analysis would imply that the probability of a respondent being poor would be influenced by the factors/variables considered in this model except that of the social status of the respondent.

## CONCLUSION

Composite index of living was estimated, and the index value was lower in category II households, which was 34 whereas it was higher in category I households. Followed by category III households which accounted to 62 and 46 respectively. The category II households wee found to be the disadvantaged category, which standard of living was lower as compared to the other category of the sample households in both economic and social aspects.

Index of deprivation (ID) was computed using the scoring technique or the identified 15 non-monetary indicators. A state of deprivation for the selected social indicators does persist among the sample households. Thus, it could be inferred that the sample households were found to be deprived based on the social indicator. However, the category II households were deprived than the other two category of sample households.

Logistic regression model to study the factors influencing a households to be poor, showed that the level of count R2 was 0.87, which indicated the good predictive ability of the model. The estimation yielded the expected signs for the coefficient of all independent variable except social status.

Since the households with dry land farming are found t be more deprived and poor the planners could encourage the establishment generating activities in rainfed areas through diversified farming enterprises. The levels of living of rural sector was found to be very low especially among the rainfed farmers due to the lack of rural infra-structure. Hence, government might the efforts to strengthen the rural infra-structure through various welfare schemes.

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# BIOCHEMICAL AND HYPOGLYCEMIC EFFECT OF SELENIUM IN ALBINO RATS

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**ABSTRACT**

**Diabetes mellitus or simply diabetes occurs throughout the world, but is more common (especially type 2) in the more developed countries. The disease affects more than 50 million Indians – 7.1% of the nation's adults and kills about 1 million Indians a year. The high incidence is attributed to a combination of genetic susceptibility plus adoption of a high-calorie, low-activity lifestyle by India's growing middle class. All forms of diabetes have been treatable since insulin became available in 1921, and type2 diabetes may be controlled with medications. Selenium is a universal essential trace element for mammals which is important for many cellular processes. Selenium is relatively well absorbed from diet better, so if it is an organic form it acts as an antioxidant in the form of selenoproteins. Selenate was shown the process of regulatory effects on glycolysis, gluconeogenesis and fatty acid metabolism, metabolic pathways which are disturbed in diabetic disorders. Selenium is a key component of a number of selenoproteins involved in essential enzymatic functions, such as redox homeostasis, thyroid hormone metabolism, immunity and reproduction. Because of antioxidant properties of selenoproteins, and because selenate insulin activity in experimental models, selenium was expected to prevent type 2 diabetes and cardiovascular disease (CVD).**

***Keywords :*** *Diabetesmellitus, selenium, albino rat.*

## INTRODUCTION

Diabetes is a group of metabolic diseases in which a person has high blood sugar, This high blood sugar produces the classical symptoms of polyuria, polydipsia (increased thirst) and polyphagia (increased hunger). Two main types of diabetes mellitus (DM) include Type 1 DM, or "insulin dependent diabetes mellitus" (IDDM) or "juvenile diabetes." (results from the body's failure to produce insulin), Type 2 DM (a condition in which cells fail to use insulin properly), previously referred to as non insulin – dependent diabetes mellitus (NIDDM) or "about-onset diabetes".

All forms of diabetes have been treatable with medications. Insulin and some oral medications can cause hypoglycemia (low blood sugars). Several areas of uncertainty in the dietary guidelines ,especially in the area of assessing micronutrient status and the role of micronutrients in the pathogenesis of diabetes and its complications exists. The role and importance of trace elements such as Selenium, Chromium, Zinc, and Vanadium are much less evident and subjected to chronic debate. Some data indicate that these metals may have a clinical interest in patients presenting deficiencies in individual metal levels. The same

holds true for an association of some trace elements such as Selenium or Chromium or Zinc with oral anti diabetics. Believably, some of these trace elements, such as Selenium, zinc, chromium and manganese, play a major role in protecting the insulin secreting pancreatic β-cells, which are sensitive to free radical damage.

Selenium is an important component of selenoproteins, which are implicated in modulating oxidative stress and regulating thyroid hormone activity. Two recent studies, examining the relationship between serum selenium levels and the prevalence of diabetes among U.S. adults found that high serum selenium levels were positively associated with the prevalence of diabetes. Selenium has a narrow therapeutic range and large inter individual variability in terms of metabolic sensitivity. Selenium species such as selenite and selenate may impair insulin responsiveness in Rats and induce a catabolic response in muscle with glycogen depletion and increased rates of glycolysis.

## MATERIALS AND METHODS

**Experimental animal:** The male albino rat, *Rattus norvegicus*.

**Maintenance and feeding of experimental animal**

- The rats were acclimated for three weeks prior to the experiment.
- The rats were fed on standard rat and mice feed manufactured by Hindustan Lever Ltd., India and water was provided *ad libitum*.

**Induction of Diabetes**

Diabetes mellitus was induced by intraperitoneally injecting alloxan monohydrate, dissolved in normal saline (12.5mg/100g). After an interval of 15 days, Diabetes mellitus was confirmed by blood sugar analysis applying Folin-Wu method, using a commercial kit.

Present investigation was conducted on 180 to 220 $\pm$ 10 gm weight albino rats. The experimental albino rats were categorized into two main groups viz. control and experimental groups. Control group contain five albino rats, experimental group contain twenty alloxan induced diabetic rats. This group was subdivided into two experimental sets A and B of five diabetic rats in each. Set- A diabetic control, Set-B diabetic rats treated with micronutrient Chromium.

**Control Group**: The five rats of control group were kept in separate from the micronutrient treated group.

**Experimental Group:**

**Experimental Set A:** In this set five alloxan induced diabetic rats were kept as diabetic control.

**Experimental Set B:** In this set five diabetic rats were kept and fed upon Selenium (@ 5.0mg/kg body wt.) mixed food for 30 days.

**Collection of blood sample:** After 30 days of post treatment with micronutrients Se blood samples were taken from both the groups I and II directly from the ventricles of the dissected rats. Blood samples were taken in vials for various haematological and biochemical investigations and transferred immediately into centrifuge tubes for the separation of serum. The blood samples were analyzed for pH using micro-blood pH assembly, total number of RBCs, WBCs, heamoglobin percentage and Packed Cell Volume (PCV) individually to each animal.

**Separation of serum:** The centrifuge tubes containing blood samples were allowed to stand in a slanting position, for about one hour at room temperature and were centrifuged at 3000 rpm for 15 minutes. The supernatant serum was taken carefully transferred to sterilized plain glass vials with the help of glass dropper for the biochemical investigations.

Experimental investigations were made on hypoglycemic effect of micronutrient Selenium in albino rats on the basis of following biochemical studies:

**BIOCHEMICAL STUDY:**

***a. Blood Sugar Estimation:*** Mark's Method

The glucose was determined quantitatively by Glucose-oxidase method.

$$Glucose + H_2 + O_2 \rightarrow Gluconic\ Acid + H_2O_2$$

***b. Glycogen Estimation:***

Glycogen was estimated in homogenates prepared in 30% KOH and anthrone reagent.

***c. Total Urea:***

Absorbance of Standard End point Dam method was used for the estimation of serum urea. According to this method blank was obtained through 1.5 ml urea colour reagent-A, 1.5 ml urea colour reagent-B, 2.0 ml urea colour reagent-C and 0.05 ml urea standard and test was obtained by 1.5 ml urea reagent-A, 1.5ml urea reagent-B. 2.0 ml urea acid reagent- C and 0.05 ml urea standard and test was obtained by 1.5 ml urea reagent-A, 1.5 ml urea reagent-B, 2.0 ml urea acid reagent-C and 50µl serum urea and kept in boiling water bath for 10 minutes. After boiling it was cooled under running tap water for 5 minutes. Optical density was measured of all the tube at 520 nm against blank adjusted to zero. The serum concentration calculated with the help of following formula.

$$\text{Total Serum Urea (mg/dl)} = \frac{\text{O.D. of Test}}{\text{O.D. of Standard}} \times 30$$

***d. Creatinine Estimation:***

Creatinine in the serum sample was determined usuing alkaline picrate method of Tora and Ackermann (1975).

***e. Total Cholesterol:***

Estimation of serum cholesterol was done with the help of one step method of Wybenega and Pillegi. According to this method 5.0 ml of cholesterol reagent was taken in Blank (B), Standard (S) and Test (T) tubes respectively. 0.025 ml distill water was added in blank tube and 0.02 ml cholesterol standard was added in standard test tube 0.025 ml serum was added in test tube and the solution was mixed them well and then the tubes were kept in the boiling water bath for 60 seconds. The tubes was cooled under running tap water measured the absorbance of test (T) and standard (S) against blank (B) on a photometer at 560 nm and calculated with the help of following formula.

$$\text{Total Cholesterol (mg\%)} = \frac{\text{Absorbance of Test}}{\text{Absorbance of Standard}} \times 200$$

**RESULTS AND DISCUSSION**

**BIOCHEMICAL STUDIES**

**a. Blood Sugar Estimation**

***Control group (A)***:

In control group of albino rats, the blood sugar (glucose) level was observed 110 mg/dl; in diabetic control group it was observed 185 mg/dl. Total blood sugar (glucose) level was found to be significantly increased in alloxan induced diabetic rats in comparison to healthy control group (Table-2, Fig.-5).

***Selenium Treated group (B):***

In this group treated with selenium blood glucose level found 137 mg/dl. The blood glucose level found significantly ($P<0.05$) decreased in comparison to diabetic control group (Table-2, Fig.-5).

**b. Glycogen Estimation**

***Control group (A)***:

In control group of albino rats, the blood glycogen level was observed 11.0 mg/dl; in diabetic control group it was observed 21.4 mg/dl. Total blood sugar (glucose) level was found to be significantly increased in alloxan induced diabetic rats in comparison to healthy control group (Table-2, Fig.-6).

***Selenium Treated group (B):***

In this group treated with selenium blood glucose level found 13.2 mg/dl. The blood glucose level found significantly (P<0.05) decreased in comparison to diabetic control group (Table-2, Fig.-6).

**c. Total Urea Estimation:**

***Control group (A)***:

In control group of albino rats, the total serum urea was observed 8.6 mg/dl; in diabetic control group it was observed 12.55 mg/dl. Total urea level was found to be significantly increased in alloxan induced diabetic rats in comparison to healthy control group (Table-2, Fig.-7).

***Selenium Treated group (B):***

In this group treated with selenium blood glucose level found 9.5 mg/dl. The blood glucose level found significantly decreased in comparison to diabetic control group (Table-2, Fig.-7).

**d. Creatinine Estimation:**

***Control group (A)***:

In control group of albino rats, the creatinine was 1.2 mg/dl; in diabetic control group creatinine was observed 2.3 mg/dl. The creatinine value was found to be significantly increased due to the diabetes in comparison to healthy control group rats (Table-2, Fig.-8).

***Selenium Treated group (B):***

The creatinine value in this group treated with selenium found 1.66 mg/dl. The creatinine value found significantly (P<0.05) decreased in comparison to diabetic control rats (Table-2, Fig.-8).

**e. Total Cholesterol Estimation:**

***Control group (A)***:

In control group of albino rats, total cholesterol level was 35.52 mg/dl; in diabetic control group cholesterol level was observed 60.45 mg/dl. The creatinine value was found to be significantly increased due to the diabetes in comparison to healthy control group rats (Table-2, Fig.-9).

***Selenium Treated group (B):***

The cholesterol value in this group treated with selenium found 42.45 mg/dl. The cholesterol value found significantly (P<0.05) decreased in comparison to diabetic control rats (Table-2, Fig.-9).

**Table - 2 : Effect of micronutrients on biochemical parameters in experimental diabetic albino rats.**

| Parameters | Healthy Control | Diabetic Control | Treatment | | | Significance value (P) |
|---|---|---|---|---|---|---|
| | | | Zinc | Selenium | Chromium | |
| Blood glucose (mg/dl) | 110 | 185 | 140* | 137* | 156 | 1.6325 |
| ± S.E. | ±0.1232 | ±1.2406 | ±0.2433 | ±0.2252 | ±0.1556 | |
| Glycogen (mg/dl) | 11.0 | 21.4 | 14.0 | 13.2 | 14.4 | 1.2335 |
| ± S.E. | ±1.1134 | ±1.3504 | ±1.3452 | ±0.6295 | ±0.2535 | |
| Total Urea (mg/dl) | 8.6 | 12.55 | 11.5 | 9.5* | 9.25* | 1.4532 |
| ± S.E. | ±0.1252 | ±0.1625 | ±0.2435 | ±0.3820 | ±0.0432 | |
| Creatinine (mg/dl) | 1.2 | 2.3 | 1.45 | 1.66 | 1.78 | 0.3425 |
| ± S.E. | ±0.3422 | ±1.4550 | ±1.3502 | ±0.4552 | ±1.3342 | |
| Total Cholesterol (mg/dl) | 35.52 | 60.45 | 40.25* | 42.45 | 44.35* | 0.8592 |
| ± S.E. | ±1.3112 | ±1.6520 | ±1.6207 | ±1.2558 | ±1.3245 | |

Values are mean, ±S.E. (Standard Error) and n=5

**Statistical analysis: P versus respective control< 0.05*

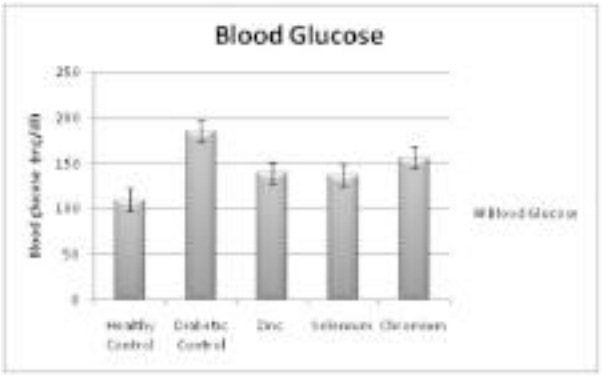


**Fig. - 5 :** Showing blood glucose level in diabetic experimental albino rats in comparison to healthy control rats.

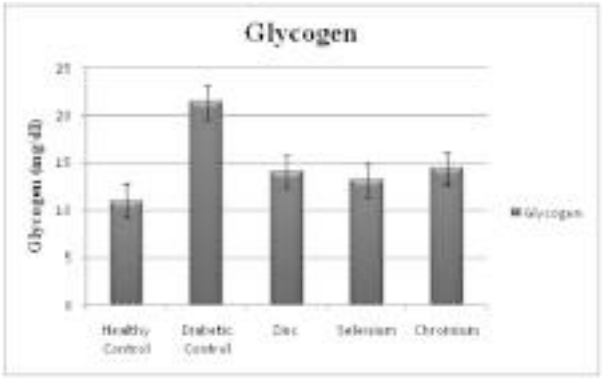


**Fig.-6:** Showing glycogen level in diabetic experimental albino rats in comparison to healthy control rats.

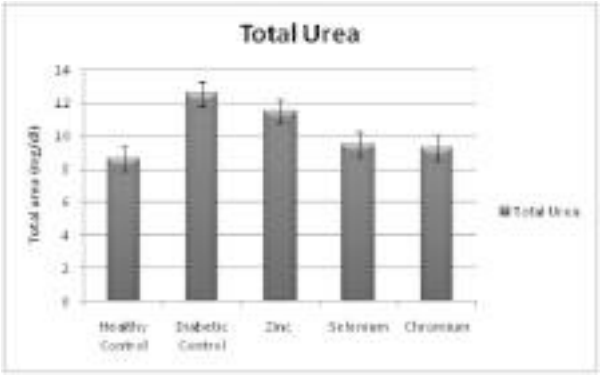


**Fig.-7:** Showing Urea level in diabetic experimental albino rats in comparison to healthy control rats.

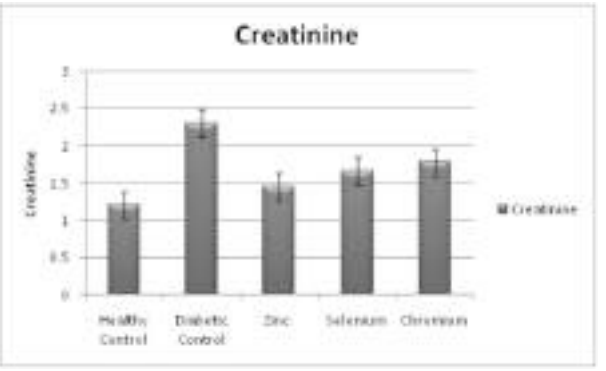


**Fig.-8 :** Showing Creatinine level in diabetic experimental albino rats in comparison to healthy control rats.

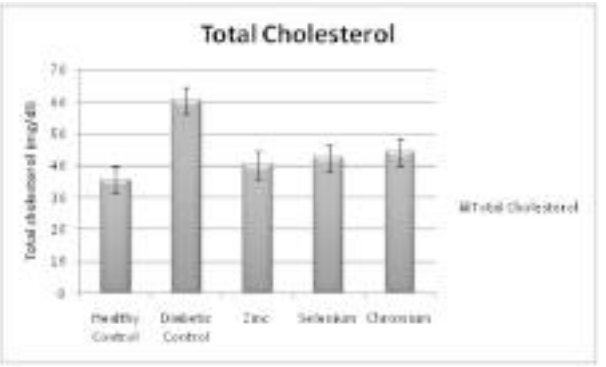


**Fig.-9:** Showing total cholesterol level in diabetic experimental albino rats in comparison to healthy control rats.

Diabetes is characterized with the loss of body weight as body protein or fats are being utilized for energy generation through gluconeogenesis. The diabetic hyperglycemia induces elevations of blood creatinine and urea levels which are considered as significant markers of renal dysfunction. A significant decrease in plasma-urea-nitrogen and plasma creatinine.

***Biochemical Study:***

In selenium Treated Groups blood glucose level, glycogen level, creatinine level found significantly decreased in comparison to diabetic control group.

**HYPOGLYCEMIC EFFECT OF SELENIUM**

Hamid R. Rasekh et al. (1919) studied the effects of acute treatment (ip) of selenium (se) on

glycoregulation and on plasma levels of glucose, insulin and corticosterone in both fed and 24 hour fasted rats. The results showed that acute intraperitoneal administration of Se (1.6 mg/kg or more) causes hyperglycemia in rats.

Selenium was considered a toxin until 1957, when this mineral was shown to be essenital in the prevention of necrotic liver damage in rats. The hypothesis of selenium chemoprevention is principally formulated by the observation that cancer incidence is inversely associated with selenium status. However, recent clinical and epidemiological studies demonstrate a role for some selenoproteins in exacerbating or promoting other disease states, specifically type 2 diabetes, although other data support a role of selenium in stimulating insulin sensitivity. In vitro se inhibited hyperglycemia or hyperinsulinaemia induced expression of adhesion molecules via reduction in p 38 MAP kinase.

Eighty weanling beef calves were used to determine the effects of Zn and se supplementation on performance, immune response, and blood characteristics during stress. Selenium improved weight gains in calves with low initial selenium status in the first 14 day of the study. (Judith K. Reffett. et al 1986).

The low concentration of selenium in serum could potentially expose the subject to oxidative stress which is known to be associated with the pathogenesis of disponeases such as diabetes mellitus (Schwartz and Reis, 2000).

Selenium has also been shown to have insulin-like properties. (Stapleton. S.R. 2000), which qualifies it as a potential antidiabetic agent.

It has been reported that oxidative stress reduces insulin secretion and increases insulin resistance in some experimental models and may thus play a causal role in the pathogenesis of diabetes. (West, 2000; Stumvoll et al., 2005; Evans et al., 2005).

Another study found that 41% of people with pancreatitis and 12% of diabetics had a low selenium concentration. (Quillio, D.et al. 2001).

Many diabetic complication are thought to be caused by oxidative damage and decreased antioxidant protection. Studies have shown that selenium can protect against oxidative damage attributable to unregulated blood sugar. (Naziroglu M. 2001 and Guney M. et al 2011).

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# ASSESSMENT OF GENETIC DIVERSITY IN GANGATIRI COW BY EMPLOYING RAPD MARKER IN SHUATS DAIRY FARM

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**ABSTRACT**

**Random amplified polymorphic DNA- PCR was employed to estimate the genetic variance and phylogenetic relation among fifteen Gangatiri animals fourteen animals (cow no.288, 348, 394, 365, 313, 364, 293, 319, 283, 208, 306, 322, 476, 478) were both sexes and one bull was selected randomly. The DNA samples were extracted from a total of fifteen Gangatiri cows and three random primers were selected. Higher genetic distance was found between cow no. 288 and 476 (D = 0.82697) and lower (D = 0.17647) between cow no 288 and 478. In phylogenetic tree the result obtained that cow no. 322, 306, 476, 478, 288 and 348 were not a better result to cross the bull because they were sibling and closely related to the bull which may caused inbreed. Therefore the Genetic diversity reduces the incidence of unfavorable inherited traits. In a little, isolated population of animal, individuals will be forced to breed with close relatives. When this happens, the genetic makeup of the individuals becomes more and more uniform, and genetic flaws become increasingly more common than the entire population was weakened. But the cow no. 364, 293, 365, 319, 313, 283, 208, and 394 were the best cow to cross the bull because their genomics and linkages a far relationship to the bull which may observed better offspring and increase the reproductive and productive performance of the entire Gangatiri herd. The level of diversity as evident in these mutants can be harnessed in breeding for better varieties as the divergent genotypes were expected to result in high heterosis. Genetic variance given strengthens and stronger the population by increasing the likelihood that at least some individuals will be able to survive major disturbances and make the group less susceptible to inherited disorders.**

***Keywords:*** *RAPD. gnetic diversity, PCR, phylogenetic, pnbreeding.*

## INTRODUCTION

Gangatiri is a dual purpose cattle breed of India. It is originated in the region along the banks of Ganga river in eastern Uttar Pradesh and western

part of Bihar state. These cattle are well adapted and medium input production system and produce 2.5 to 8.0 liter milk per day. The lactation length is 150-250 days. Inter-calving period varies from 14-24 months. The average milk production of Gangatiri cow is 4.5 liter per day and fat percentage is from 4.1 to 5.2% (Anonymous 2006). It is a medium size breed reared by poor farmers on zero or low input system for their livelihood (Singh et al. 2007). A livelihood is socially sustainable when it can cope with and recover from stress and shocks and provide for future generations (Chambers and Conway1992).The breed significantly contributes to the livelihood of the people due to its good dual purpose. Genetic variation is an idea of the resourcefulness exists in nature. It will also been explained that even progenies of specific mating, including full sibs, differ in genetic constitution. This genetic variation helps the population to change the condition of over time. Therefore, the variation is the raw material, which a breeder can exploit for the improvement of the population. To a breeder, variation is a future hope for getting better offspring than parent. The variation is also act in opposite direction by resulting into mediocre or poor progenies even if a breeder possesses superior parents if no proper selection is practiced. Therefore, it is essential for a breeder to find out the measure of a population or individual to identify it, in term of its genetic worth and variability. This could easily be done by using a DNA marker known as RAPD-PCR marker. Among various fingerprint type DNA markers, randomly amplified polymorphic DNA (RAPD) continues to be a popular and widely used marker system. The RAPD could be used to generate genotype specific banding patterns in many animal species. Thus of RAPD in poultry for strain-identification purposes had progressed rapidly during the last decade. The effectiveness of RAPD is detected the polymorphism between chicken breeds and establishing genetic relationships among its population had been reported by Sharma et al. (2001). The RAPD is provided a simple, fast and a comparatively lows-cost marker system which has gained wide acceptance, worldwide. The RAPD has successfully been used in generating polymorphism in livestock and poultry (Smith et al., 1996; Zhang et al., 1995). However, Zhang et al. (2002) reported that RAPD is less effective in generating polymorphism and required huge number of random primers to produce sizeable polymorphism. Therefore the aim of the present perusal is to undertaken intra molecular characterization by comparing Gangatiri breeds. RAPD fingerprint markers, for addressing many of the evolutionarily important questions. Therefore, the present study entitled "Assessment of Genetic Diversity in Gangatiri Cow by Employing RAPD Marker in SHUATS dairy farm" would be undertaken in herd of Department of Animal Husbandry & Dairying (AH&D), Sam Higginbottom University of Agriculture, Technology & Sciences, Allahabad.

**MATERIALS AND METHODS**

The experiment was carried out at the Micelles Life Science (Pvt.) Ltd., 4/462, Vibhav Khand, Gomti Nagar Lucknow, U.P. The details of materials and methods used are described as follows.

The total of fifteen animal of Gangatiri cows were selected from Department of Animal Husbandry and Dairying SHUATS. 5ml of blood was collected from each animal in a10 ml EDTA vacationer tube and kept in ice box during collection and then transported to the laboratory and stored at -$20^0$C until the isolation of genomic DNA. The cattle identification numbers are given in table 1.

**Table -1**: **Cattle's identification numbers and sex.**

***Extraction of genomic DNA from blood samples***

| Code | Cow Number |
|---|---|
| 1 | 288 |
| 2 | 348 |
| 3 | 394 |
| 4 | 365 |
| 5 | 313 |
| 6 | 364 |
| 7 | 293 |
| 8 | 319 |
| 9 | 283 |
| 10 | 208 |
| 11 | 306 |
| 12 | 322 |
| 13 | 476 |
| 14 | 478 |
| 15 | Bull |

DNA was extracted from blood by MLS blood genomic DNA kit protocol. The present of DNA in the extracted sample was confirmed by running the sample in a 1% agarose gel at 80V for 48 minutes. The quality of DNA was measured by spectrophotometer at 260nm wavelength.

***PCR reaction***

*Primer Selection* In this study three universal RAPD primers were selected. List of the primers along with their sequences are shown in table 2.

**Table - 2 : List and sequences of primer used in the experiment**

| S.N. | Primer | GC % |
|---|---|---|
| Primer 1 | 5' – CCCHGCAMCTGMTCGCACHC – 3' | 60% |
| Primer 2 | 5' – AGGHCTCGATAHCMGVY – 3' | 41.18% |
| Primer 3 | 5'– MTGTAMGCTCCTGGGGATTCHC – 3' | 50% |

*PCR amplification*

PCR reaction were performed on each DNA sample in a 25µl reaction mix containing gDNA 1.0µl, RAPD primer (100ng/µl) 2.0µl, dNTPs (10mM) 1.0µl, TaqPol Assay buffer (10X) 2.5µl, Taq DNA Polymerase (3U/µl) 0.5µl and water 18µl. DNA amplification was performed by thermal cycle. The amplification program included an initial denaturation step of $94^0$C for 5 minutes followed by 40 cycles of $94^0$C denaturation 1 minute, $54^0$C annealing 1 min, and $72^0$C extension for 2 minutes. The final extension was performed at $72^0$C for 15 minutes and held at $8^0$C.

**Gel electrophoresis of PCR amplified product**

Prepare 1X TBE by diluting appropriate amount of 10X TBE buffer. Weigh 0.5 g of agarose and add to 50 ml of 1X TBE. This given 1% agarose gel. Boil till agarose dissolved completely and a clear solution results. Add ethidium bromide to molten agarose to a final concentration of 0.5 µg/ml (from a stock of 10 mg/ ml in water), when temperature is $50^0$C. Mean while place the combs of electrophoresis set such that it was approximately 2cm away from the cathode. Pour the agarose solution in the central part of the tank (the thickness of the gel should be 0.5 – 0.9 cm). Keep the gel undisturbed at room temperature for the agarose to solidify. Pour 1X TBE buffer into the gel tank till the buffer level stands at 0.5 – 0.8 cm above the gel surface. Gently lift the combs ensuring that the wells remain intact. Connect the power cord to the electrophoretic power supply according to the convention, red - anode and black – cathode. Mix 5 µl of gel loading buffer with 15µl of the sample and load the wells. Set the voltage to 50V and switch on the power supply. Switch off the power supply when the tracking (Bromophenol blue) from the well reaches ¾ of the gel. Observe the bands under UV transilluminator for checking the DNA bands and photographed using a digital camera.

*Data analysis*

Only distinct and prominent band were scored for estimation of various parameters. The presence and absence of band was recorded as "1" and "0" respectively. The binary coded characters (1, 0) were used for genetic analysis. Statistical analyses were carried out for estimation of genetic distance, identity and phylogenetic relationship among 15 breed of Gangatiri cow. The relationship among breeds of Gangatiri cow was analyzed by generating dendogram using Nei genetic distances with UPGMA (Un- weighed pair group method using arithmetic average) analysis through PHYLIP software.

**RESULTS AND DISCUSSION**

A genetic analysis used Random Amplified Polymorphic DNA markers were performed to determine the primers and generate RAPD fingerprints to find out genetic variability and phylogenetic relationship among the percentage of Gangatiri breeds. The DNA fragment to be enlarged was determined by selecting primers. Primers were short, artificial; DNA strand often nor more than 50 and usually only 17 to 22 base pair long that were complimentary to the beginning or the end of the DNA section to be enlarged. They anneal with adhere to be DNA template that these preliminary and conclusion points, which position the DNA polymerase binds and commence the amalgamation of the novel DNA strand. . Primers that were too tiny would anneal at quite a few position on a long DNA template, which would consequence in non specific copies. In contrast the length of the primers was inadequate by the temperature essential to melt it. The melting temperature those are too high, i.e., higher than $80^0$C, that cause inconvenience in view of the piece of information that the DNA polymerase was fewer active at such temperature. The optimum length of primers was generally from 17 - 22 nucleotides in the midst of a melting temperature among $45^0$C and $55^0$ C.

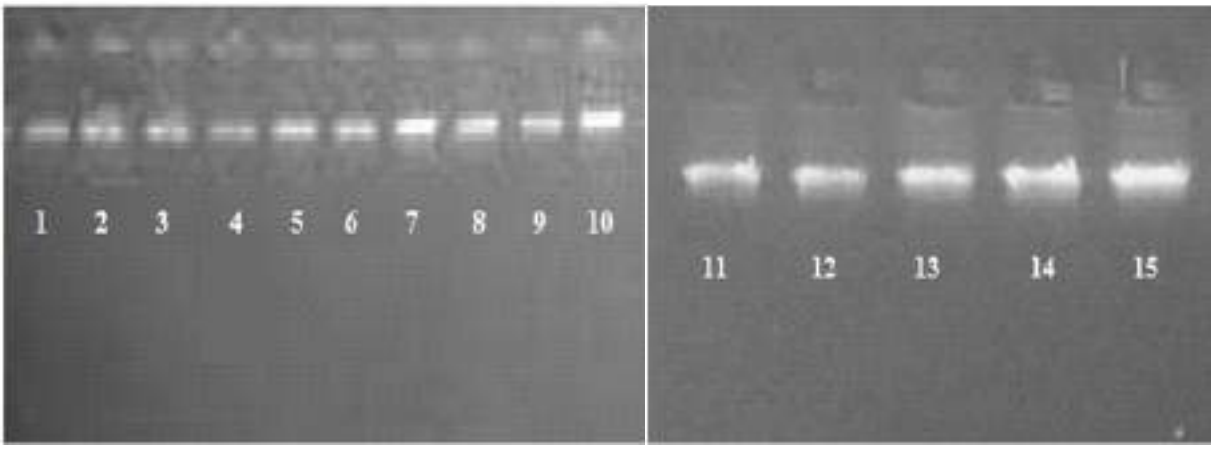


**Fig. -1.** ***Genomic DNA extracted from 15 blood samples loaded on 1% agarose gel*** **Lanes 1 to 10 – gDNA of Samples 1 to 10 and Lanes 11 to 15 – gDNA of Samples 11 to 15**

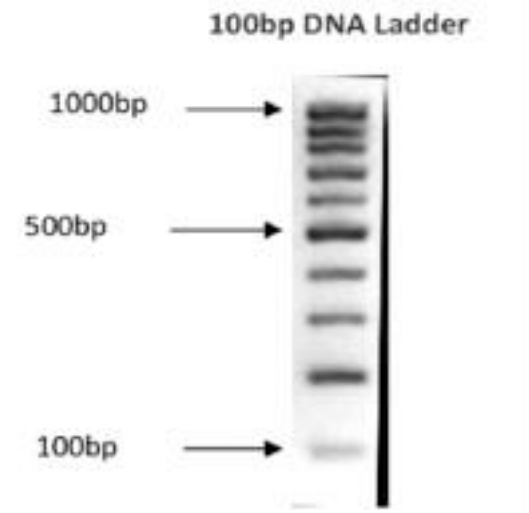


**Fig.-2: 100 bp Ladder contains 10 DNA fragments of size 100 bp, 200 bp, 300 bp, 400 bp, 500 bp(Spiked), 600 bp,700 bp, 800 bp, 900 bp and 1 kb**

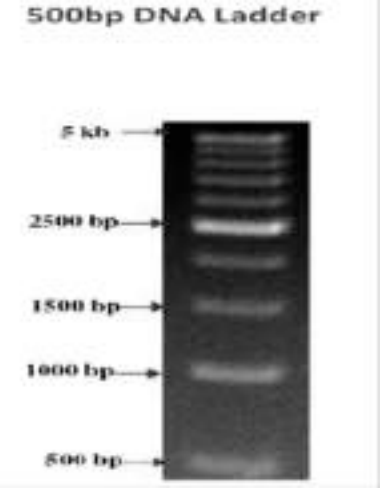


**Fig.-3: 500 bp ladder contains 10 DNA fragments of size 500 bp, 1000 bp, 1500 bp, 2000 bp, 2500 bp, 3000 bp, 3500 bp, 4000 bp, 4500 bp and 5000 bp.**

They are extremely rich in the genomes of eukaryotes, polymorphic and more often than not co-dominant and manageable among dissimilar mapping populations. RAPD markers were capable of also be second-hand in automated genotyping techniques. RAPD have been exposed to be one of the majority commanding genetic markers in biology. It definite as runs of tandem repeated DNA; they demonstrate an elevated degree of polymorphism caused by the mutation distressing the number of replicate units. This agitated variability in the middle of related organisms makes them outstanding markers for genotype classification, examination of genetic diversity, phenotype mapping and marker assisted variety of animal. The best possible size for the primers was 17, 20 bases, with a greatest of 22 bases. The best possible melting temperature is 45$^0$C, and a greatest of 72$^0$C. The best possible GC content is set to 50%, with a bare minimum of 41.18% and a greatest of 60%.

**Distance Matrix Table RAPD**

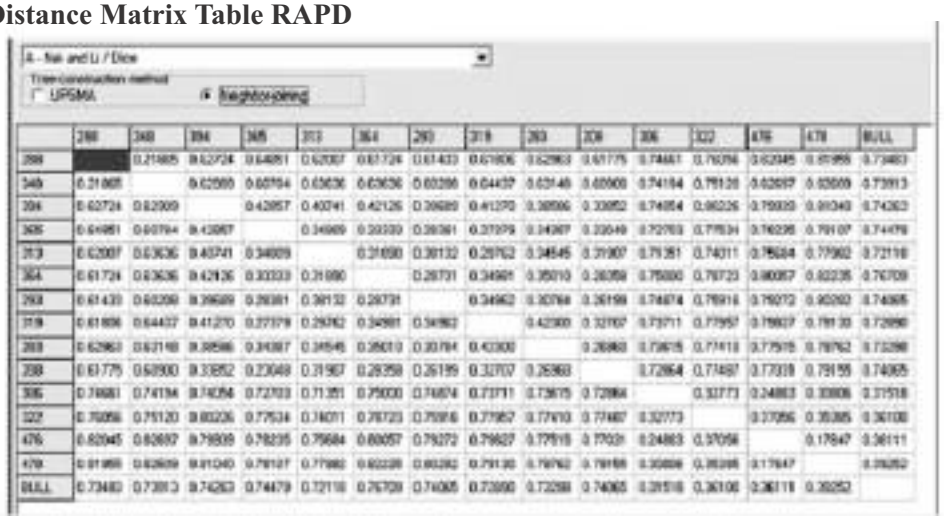


**Fig.- 4 : Estimation of pair wise genetic distance between experimental Gangatiri cattle using Nei's equation.**

The genetic distances between breeds were calculated using Nei equation through POPGENE software (Figure 4). In the current study of an individual primer produced more variable results as compared to results obtained by all primers hence all primer data were pooled for estimation of genetic parameters. Neighbor-joining method was proposed for reconstructing phylogenetic trees from evolutionary distance data. The principle of this method was to find pairs of operational taxonomic units (OTUs [= neighbors]) that minimize the total branch length at each stage of clustering of OTUs starting with a star like tree. The maximum genetic distance value 0.82697 was observed between cow no. 288 and 476 but the minimum genetic distance value 0.17647 was found between cow no. 288 and 478. Cow no. 322,306, 476, 478, 288 and 348 were found closely genetic distant to the bull.

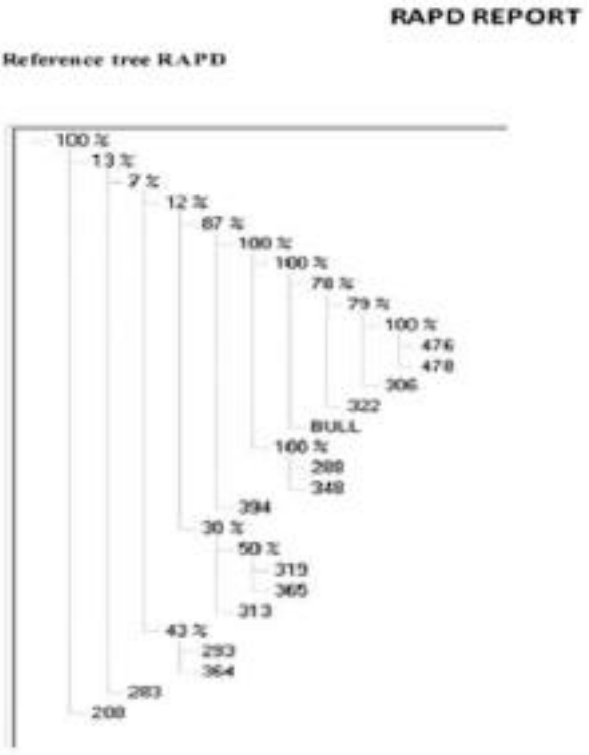


**Fig.-5:** RAPD tree shows different percentage relationship among fifteen Gangatiri cattle.

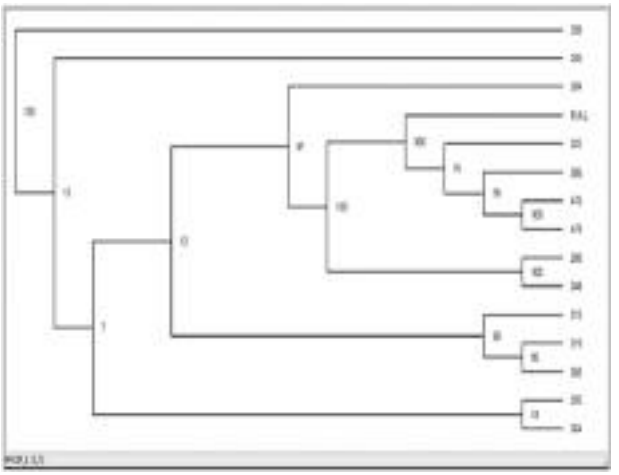

**Fig.-6: Phylogenetic relationship among breed of Gangatiri based on RAPD pooled data from 3 primer using UPGMA analysis.**

Visualization of breed relationship using reference tree obtained from UPGMA (unweighted pair group method with arithmetic mean) was the simplest method of tree construction. It originally developed for constructing taxonomic phonograms that is trees that reflect the phenotypic similarities between OTUs, (operational taxonomic unit) but it also be used to construct phylogenetic trees if the rates of evolution were approximately constant among the different lineages. For this purpose the number of observed nucleotide or amino-acid substitutions to be used. Unweighted pair group method with arithmetic mean employs a sequential clustering algorithm, in which local topological relationships were identified in order of equality and the phylogenetic tree was built in a stepwise method. Cow no.364 was 43% similar to cow no. 293. Cow no. 365 and 319 were 50% similar to each other but cow no 319 was 30% similar to cow no was 313. Cow no.478 and 476 were 100% similar to each other but cow no. 476 was 79% similar to cow no. 306. Cow no. 306 was 78% similar to cow no. 322 and cow no. 322 was 100% similar to bull but the bull was 100% similar to cow no. 288. Cow no. 348 was 100% similar to cow no. 288 and cow no. 288

was 87% similar to cow no. 394. Cow no. 313 was 12% similar to cow no. 394 then cow no. 293 was 7% similar to the cow no. 313. Cow no. 293 was 13% similar to cow no. 283 and finally cow no. 283 was 100% similar to cow no. 208. Ultimately observed that cow no. 322, 306, 476, 478, 288 and 348 were not a better result to cross the bull because they were sibling and closely related to the bull but the cow no. 364, 293, 365, 319, 313, 283, 208, and 394 were the best cow to cross the bull because their genomics and linkages a far relationship to the bull.

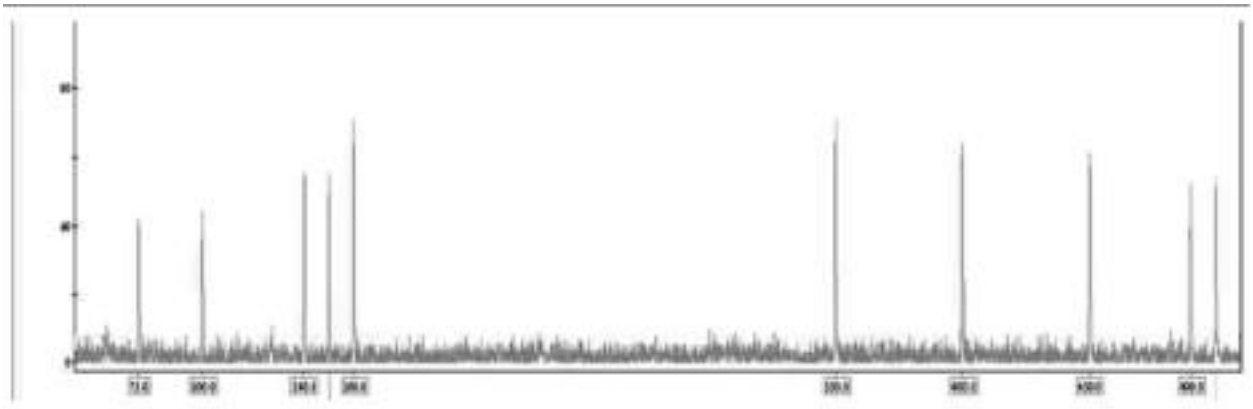

**Fig.-7: Gene Scan 500 Liz size standard is a fifty dye labeled size standard for the reproducible sizing of fragment analysis 35-500 nucleotide range data.**

Gene Scan™ 500 LIZ® Size paradigm was premeditated for sizing DNA fragments in the 35-500 nucleotides choice and provides 16 single-stranded labeled fragment of: 35, 50, 75, 100, 139, 150, 160, 200, 250, 300, 340, 350, 400, 450, 490 and 500 nucleotides. The sizing curve designed commencing these fragments construct the Gene Scan™ 500 LIZ® Size paradigm perfect for a assortment of fragment assessment applications for instance Microsatellites, Fragment Length Polymorphisms and Relative Fluorescent Quantization as shown in figure 7.

**CONCLUSION**

The result obtained that cow no. 322, 306, 476, 478, 288 and 348 were not a better result to cross the bull because they were sibling and closely related to the bull which may caused inbreed. Therefore the Genetic diversity reduces the incidence of unfavorable inherited traits. In a few, isolated population of organisms, individuals will be forced to breed with close relatives. Therefore the genetic makeup of the individuals becomes more uniform, and genetic flaws become increasingly more common. In closely related organisms any genetic weaknesses that were hidden in the parents can be multiplied in the offspring. Animals can be carried of a gene for an inherited disease, but not show any symptoms. If they mate with a partner who was also a carrier, then the offspring may exhibit symptoms of the disease. In an inbred population, chances were greater that carriers will interbreed. Over time, the entire population was weakened. But the cow no. 364, 293, 365, 319, 313, 283, 208, and 394 were the best cow to cross the bull because their genomics and linkages a far relationship to the bull which may observed better offspring and increase the reproductive and productive performance of the entire herd. Therefore genetic diversity strengthens and stronger the population by increasing the probability that at least few individuals will be able

to survive major disturbances, and by making the group less susceptible to inherited disorders.

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# SOC STOCK AND C SEQUESTRATION IN VERTISOL AFTER 44 YEARS IN SOYBEAN-WHEAT CROPPING SYSTEM INFLUENCED BY LONG TERM FERTILIZATION

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**ABSTRACT**

**An attempt has been made to examine the explanatory observations on the black money generation in India. The emergence of the black sector or black economy started during the second world war when due to shortage experienced in certain essential goods. Controls and rationing had to be introduced but this was a phenomenon which was expected to end after the second world war. With the expansion of economic activity in the post independence period. The magnitude of the black sector has grown and proliferated to such an extent that it was began to play a dominant role in moulding state politics, in changing the structure and composition of output in promoting a class which derives its maximum source of power from black money.**

**Obviously, the magnitude of operations of the black money operators has resulted in the establishment of a parallel economy. If the parallel economy poses the serious threat to stability and growth of the official economy; surely it stems from the fact that the magnitude of black money. It is firmly believe the system of controls, permits, quotas and incomes which are associated with mal distribution of the commodities in short supply results in the generation of black money. In other words, elasticity of increase in tax revenue as a consequence of the reduction in the marginal rate of taxation is loss than unity.**

**The political instability witnessed in the country in various states has resulted in widespread horse training of the MLAs as the state level and MP, at the central level.**

**In this process of buying political support, black money plays a crucial roles consequently the determination of the ruling political party to curb black money has become very weak. As a consequences, businessman feel they have an unfettered licence to spin black money. Pay a small part to the political parties as donations and then enjoy the rest the way they like. Unless the line between black money and political power is broken, there is no hope of controlling the generation of black money or its link with crime. Tenders are invited for the various works and these tenders are awarded by the bureaucracy in consultation with political bosses. Thus, a symbiotic relationship develops between the contractors, bureaucracy and the politicians and by a large number of devices, costs are artificially escalated and black money is generated by under hand deals. The large number of scandals that are lineated by the opposition only support the contentious that huge investment in the public sector is a big potential source for black money generation.**

***Keywords :*** *Fertilization, soyabean, wheat cropping system, soc, stock.*

## INTRODUCTION

The emergence of the black economy started during the second world war when due to shortages experienced in certain essential goods, controls and rationing, had to be introduced but this was a phenomenon which was expected to end after the second world war. However with the attainment of independence and the advent of planning, more avenues of investment in a large number of industries were opened. The concept of the mixed economy envisaged the co-existence of a public sector and a private sector. Both were expected to promote investment and output. The criterion in the public sector was social gain and thus it concentrated on the creation of economic infra-structure in the form of roads, railways, irrigation and hydro electric works etc. the development of heavy, basic and defence industries and the provision of better education and health facilities. The rest of economy was left to be developed by the private sector.

With the expansion of economic activity in the post-independence period, the magnitude of the black sector has grown and proliferated to such on extent that it has begum to play a dominant role in moulding state policies, in changing the structure and composition of out put, in promoting a class which derives its maximum source of power from black money. Obviously, the magnitude of operations of the black money operators has resulted in the establishment of parallel economy.

D.K. Rangenkar rightly mentions: “If the parallel economy” poses a serious threat to stability and growth of the official economy, surely it stems from the fact that the magnitude of “Black Money” is large and rigged deals are growing in volume and complexity at an alarming rate. Apart from the wide ramifications of the “Parallel Economy”, one might also be alive to the fact that “black incomes” are accentuating the inequalities in income and wealth and breeding a new class of “black” rich in a society which is already harshly stratified. The inequalities are no longer below the surface. The conspicuous consumption of the new “black: rich, their vulgar display of pomp and opulence, their unlimited accessibility to finance. To understand the impact of black economy, it is essential to have an estimate of 'black income' over a period of time.

## MATERIALS AND METHODS

Several attempts have been made to quantify black incomes in India broadly speaking. The various estimates of black incomes made so for follow two approaches.

(i) Kaldor's approach of quantifying non-salary incomes above the exemption on limit of income tax and

(ii) Edger L. Feige's method of working out transaction income on the basis of currency deposit ratio and from it deriving the black income of the economy. Kaldor's method has been used in the report on Indian tax reform, and later by the direct raxes enquiry committee with some modifications. D.K. Rangnekar, former editor economic times, used the same technique with some more modifications and Later Mr. O.P. Chopra developed a series of black income by further modifying, the Wanchoo Committee's assumptions.

**Estimates of black income on Kaldor's approach:**

(i) Kaldoer's estimate: N. Kaldor in his report of India tax reform estimated the non-salary income on the basis of the break-up of national income (a) wages and salaries (B) Income of the self-employed and (c) profit, interest, rent etc. excluding wages and salaries from the contribution to net domestic product, he derived total non-

salary income. For various sectors of the economy. On the basis of assumed proportions of non-salary incomes above the exemption limit. An estimate of the actual non-salary income assessed to tax was made fro each sector in order to arrive at the total non-salary income assessed to tax. The difference between the estimated non-salary income above the exemption limit and the actual non-salary income assessed to tax measures the size of the black income.

(ii) Wanchoo committee's estimate: Direct taxes enquiry committee (Wanchoo committee) followed the method adopted by Kaldor with suitable modifications. It estimated assessable non-salary income for the year 2008-09 as Rs. 12684 lakh crores and non-salary income actually assessed to tax to be of the order of Rs. 11875 lakh crores. Accordingly the income which escaped income tax was of the order of Rs 1881 crores. According to Wanchoo committee, the estimated income on which tax has been evaded (black income) would probably be Rs. 1700 crores and 2000 crores for the year 2009-10 and 2010-11 repectively.

(iii) Rangnekar's estimate: Dr. D.K. Rangnekar as member of the Wanchoo committee, in this minute of dissent considers the estimates made by the Wanchoo committee as under estimate, according to him, tax evaded income for 2008-09 was the order of the Rs. 29150 croresa, as compared to the DTEC estimate of 7450 crores for 2009-10. It was Rs. 12350 crores. As against Rs. 16462 crores estimated by DTEC. The projection of black income for 2009-10 & 2010-11 were Rs. 28462 crores and Rs. 30988 crores respectively. Rangenekar concluded "the compound rate of growth of "Black income" was of the order 17 per cent per annum of current prices whereas the compound rate of growth of national income for the same period was 15 per cent per annum.

(iv) Chpora;s estimate: Mr. O.P. Chopra prepared a series of unaccounted income (black income) for period 20 years. The Chopra uses a slightly modified methodology recommended by the direct taxes enquiry committee since it is difficult to obtain information on non-salary income actually assessed, the DTEC assumed the ratio of evaded income to non-salary assessable income to remain constant. Chopra gives us this assumption in favour of a less demanding assumption. The study shows that a buoyant economy offers more apportunities for unaccounted income. During periods of recession, it may be difficult for producers to extract unaccounted money. The crucial finding of Chopra's study is that the ratio of unaccounted income to assessable non-salary income has gone up, whereas the Wanchoo committee assumed their ratio to have remained constant.

**RESULTS AND DISCUSSION**

National institute of public fiancé and policy (NIPEP) conducted a study under the direction of Dr. S. Acharya, formerly of the world bank. Dr. Raja Chelliah was the overall supervisor of the study. The study defines black income as "aggregate of incomes which are taxable but are not reported to tax authorities". The study however, gives a broaders definition of black income and calls it as "unaccounted income" for purpose of clarity. It

is the extent to which estimates of national income and out put are biased downwards because of deliberates, false reporting of incomes, out put and transactions for reasons of tax evasion, to floating of other economic controls and related motives. While preparing the estimate of black income, the study excludes incomes generated through illegal activities like smuggling, black market transactions, acceptance of bribes, Kickbacks etc. to prepare a global estimate of black income, the study confines itself to following areas.

(i) Factor incomes received either openly or coverly while participating in the production of goods and services- the study estimated that on account of under reporting of output or sales or cover reporting of the costs or miss classification of personal expenses by manufacturing/trading enterprises. The GDP figures have to be revised upwards by 10 per cent.

(ii) Black income generated in relation to capital receipts on sale of assets- the study assumes that in real estate transactions, the black-white ratio was 40:60 as the minimum average fro all India. In other words, the registered value represents only 60 per cent of the true value of the property. The study, however, also admits that in several areas this ratio may be an under estimate. For instance, the sample survey of real estate brokers in Delhi indicated that the ratio of black to white components ranged from around 65 to 75 in 2007-08, 80 to 90 in 2009-10 and 70 to 90 in 2010-11. however, the study admits the value of property under power of attorney transfer is also not included in our base. Thus to that extent, out estimated is downward biased.

(iii) Fixed capital formation in the public sector: the key area in which such leakages occur are found to be investments in construction and plant and machinery. The study assumes a range of 10-15 per cent of the cost of construction to be sitroned of as black income. So far as plant and machinery are concerned. The study assumes a 5 per cent leakage only in relation to investment in plant and machinery by administrative departments and no leakage at all in relation to investment in plant and machinery by departmental enterprises. Although the study admits that there is considerable leakage in machinery imported from abroad, but on account of paucity of information, no estimate of such leakage has been incorporated in the black income estimate.

(iv) Black income generated in relation to private corporate sector: The study assumes a leakage of 10-15 per cent to be a safe range in relation to private corporate investment by way of Kick-backs from supplies and contractors.

(v) Black income generated in relation to exports: The study mentions: there is not much evidence of under invoicing is believed to exist in relation to traditional exports. The study assumes of 10 per cent of POB value of traditional exports to be the amount of black income generated.

(vi) Black income generated through over-invoicing of imports by the private sector and sale of imports licences: The study assumes 10-15 per cent leakage in relation to private corporate sector. In investment which includes imported machinery as well as machinery purchased domestically. Similarly, the study assumes that half of the

REP Licences are sold away at 25 per cent premium. The study after aggregating the different components of black income concludes. Our global estimate of black income ranges from Rs. 51780 to Rs. 112367 crores in 2008-09 and from Rs. 94632 Rs. 137628 crores in 2009-10 in terms of per cent of EDP. These estimates range from 15 to 18 per cent in 2008-09 and from 18 to 21 per cent in 2009-10. a closer examination of the data reveals that in 209-10 nearly 48 per cent of black income generation was through evasion of taxes in personal income, 28 per cent due to under-exporting of output and 18 per cent due to under-registration of immovable property. In other words, these three components accounted for 94 per cent of black income generation.

(vii) Suraj B-Gupta study of black income: Dr Suraj Gupta made a guesstimate of black income for thrice selected year 1980-81, 1983-84 and 1987-88. He believes that NIPEP estimate of black income by S. Acharya as an under-estimate and that actual generation of black income is much more. For instance, he assumes that NAS under estimates GDP by 15 per cent, and that 80 per cent of it across to income tax payers.

**Table - 1 : Global estimate of black income generated in India**

**(Rs. Crores)**

| S. No. | Particulars | 2016-17 | 2017-18 |
|---|---|---|---|
| 1. | From gross personal income | 10741 | 31436 |
| 2. | Under-reporting of output | 6515 to 8473 | 8316 to 9643 |
| 3. | Under-registration of immovable property | 3783 | 5379 |
| 4. | Leakages from public sector investment | 787 to 845 | 1125 to 1766 |
| 5. | Leakage from private corporate sector investment | 2852 to 472 | 467 to 645 |
| 6. | Under invoicing of exports | 239 | 432 |
| 7. | Total black income | 17687 to 23938 | 30942 to 38694 |
| 8. | GDP at factor cost, current prices | 96438 | 136574 |
| 9. | Black money as per cent of GDP (718x100) | 15 to 18 | 18 to 21 |

Source: Abstracted from aspects of black & economy in India P-431

Thus, the guesstimate will straight way and 12 per cent of GDP to tax evaded income. As against the NIPEP assumptions of black income generation from private corporate tax evasion to be least 30 per cent of corporate tax actually collected in the year. Regarding excise duty evasion has estimated. That leakages on excise revenue amount to at least half of the duty actually paid. With corruption mounting forward in the excise department, Gupta assumes that excise duty evasion was atleast 40 per cent of the potential duty amount. Black income from customs (imports) duty evasion has been taken as not less than 30 per cent of the customs duty if there was no evasion. Similarly, Suraj Gupta speaks of smuggling as a growth industry in India and its guesstimate has been reckoned at his 92000 crores in 20098-10

Gupta mentions. This major direct source of black income from smuggling is the evasion of customs duties and sales tax and black gains through associated hawala transactions (P-41).

**Table - 2 : Suraj B. Gupta's guesstimate of black income generation**

**Rs. Crores)**

| S. No. | Source | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|
| 1. | Income tax evasion | 34645 | 52789 | 65194 |
| 2. | Corporation tax evasion | 637 | 893 | 1120 |
| 3. | Black gains in real estate | 73470 | 11725 | 36446 |
| 4. | Excise duty evasion | 8436 | 10324 | 14728 |
| 5. | Custom duty evasion | 2562 | 3742 | 7984 |
| 6. | Black income for on smuggling | 1837 | 3746 | 19163 |
| 7. | Black money from exports | 2008 | 2146 | 2572 |
| 8. | Evasion from state taxes | 7812 | 10723 | 21464 |
| 9. | Black money from public expenditure | 6732 | 8946 | 18322 |
| | (a) States | 2846 | 1972 | 2399 |
| | (b) …….. | 5462 | 8726 | 12671 |
| 10. | Black money from private corporate investment | 110546 | 172826 | 246719 |
| 11. | Total (1 to 10) | 218462 | 383510 | 410827 |
| 12. | GDP at factor cost current prices | 41.71 | 45.81 | 50.71 |
| 13. | 11 as percentage of 12 | 74622 | 110721 | 124628 |
| 14. | GDP at factor cost (Agril sector) | 25742 | 128432 | 310746 |
| 15. | GDP at factor cost (Non-Agril sector) | 67.45 | 71.91 | 72.11 |
| 16. | 11 as % of 15 | | | |

Source: Suraj B. Gupta Black income on India

Through associated Hawala transactions (P-41)

Black income is also generated by grossly under invoicing traditional exports and misinvoicing non-traditional exports. There major states viz., sales tax, state excise duty and entertainment tax are the principal sources of tax evasion. On the basis of some empirical findings, Suraj Gupta assumes evasion of 47 per cent of the potential tax revenue in these three taxes and 30 per cent of tax evasion in the other state taxes.

**Impact of black incomes on the economic and social system:**

The creation of a parallel economy as a consequence of the growing proliferation of black money in every sector of the economy has very serious and in number of ways pernicious influences on the working of the Indian economy. It would be of interest to study their impact on the Indian economic. First of all, the direct effect of black income is the loss of revenue to the state exchequer as a consequence of tax evasion, both from direct and indirect taxes. Moreover tax evasion does not include. Loss of revenue resulting from unreported production or illegal economic activity. Since the government is not able to plug the leakage of tax evasion. It has to resort to other avenues of raising funds so it imposes more taxes on commodities or raises the existing rates of taxation on commodities.

Secondly the availability of black incomes with businessman and capitalists and the consequent inequalities of income place a large amount of funds

at their disposal easy money as it obtains thirdly, black money encourages investment in precious stones, jwellery, bullion etc. This has an adverse effect on growth via its demonstration effect.

Fourthly, black money has encouraged diversion of resources in the purchase of real estate and investment in luxury housing. There is large scale under valuation of property and in this way, lot of black money as made white. This has also purchased up the prices of land to astronomical heights because of speculative purchase of land by black money operators. As a consequence, the middle classes are priced out in the purchase of land fro houses.

Fifthly, a part of the black incomes is held in cash and as a consequences there is an abundance of equality which becomes available through the accumulation of saving held in the form of cash bullion, gold, silver etc. This is popularly termed as black liquidity. Sixty, black money results in transfer of funds from India to foreign countries through clandestine channels. Such transfers are made possible by violations of foreign exchange regulations. Through the device of under invoicing of exports and over invoicing of imports.

**Factors responsible for generation of black money:**

There are several factors responsible for the generation of black money- it would be relevant to discuss those factors so that a correct understanding about the genesis, growth and expansion of black money can be made. The principal factors are:

**(i) Divergence between the acceptable net rate of return and legally permissible rate of returns:**

The chief factor responsible for generation of black incomes is that individual expect a higher net rate of returns then the legally permissible rate of returns. In this connection, the higher marginal rates of taxes assume special importance. The chamber of commerce and industry hold a unanimous view that very high rate of taxation on incomes above a certain limit are in the fact expropriatory in nature.

**Table -3 : Estimated evasion of income tax revenue (TR) in non-corporate sector**

**(Rs. Crores)**

| Year | Potential TR using actual average tax rates | Actual income tax revenue collected | Evaded tax revenue | Col 4 as percentage of Col 2 |
|---|---|---|---|---|
| (i) | (ii) | (iii) | (iv) – ii-iii | V = iv/2x100 |
| 2011-12 | 6431 | 687 | 5744 | 77.4 |
| 2012-13 | 6743 | 787 | 5962 | 75.32 |
| 2013-14 | 7284 | 996 | 6288 | 77.8 |
| 2014-15 | 8749 | 1102 | 7647 | 73.8 |
| 2015-16 | 7830 | 1583 | 8247 | 78.1 |
| 2016-17 | 11247 | 1894 | 9353 | 76.7 |
| 2017-18 | 13456 | 2012 | 11444 | 80.3 |

Source: Extracted from K.N. Kabra, the black economy in India

The upshot of Kabra's analysis is that whereas it may be conceded that higher marginal rates of taxation motivate tax evasion because of its expropriator nature, a reduction in the marginal rate of taxation, even though sustained, is no generatea that tax evasion would not be resorted to, if the costs and risks involved in tax evasion are considerably less than the amount of money converted into black income.

**(ii) Black money generation as a consequence of controls licensing system:**

it is firmly believes that the system of controls, permits, quotas and licences which are associated with maldistribution of the commodities in short supply results in the generation of black money. The Wan Choo committee explaining this factor as a source of black money observed. Inspite of the vigilance exercised by the government, controls and regulations came to be used by the unsurpulous for amassing money for themselves. Since considerable discretionary. Power lay in the hands of those who administered controls. This provided then with a scope for corruption to speed money for turning a blind eye to the violation of controls. All this gave rise to trading in permits quotas and licences. Malpractising in distribution and in the process it generated sizable sums of black money.

**(iii) Donation to political parties:**

Ever since the government decided to ban donations to political parties. It promoted businessman to found political parties, especially the ruling party, with the help of black money. Ostensibly, this decision was taken to reduce to influence of big business on the electoral process, but in practice what happened was precisely the opposite.

**(iv) Generation of black money in the public sector:**

Every successive five year plan planned for a large size of investment in public sector. The project undertaken by the public sector have to be monitored by the bureaucrats in government departments and public sector undertaking. Tenders are invited for the various works and these tenders are awarded by the bureaucracy in consultation with the political bosses.

**(v) ineffective enforcement of tax laws:**

Whereas the government has an armory of tax laws pertaining to income tax, sales tax, stamp duties, excise duty etc. their enforcement is very weak due to widespread corruptions in these departments. The high rates of these taxes induce businessman to avoid recording of these transaction. This evasion largely goes in checked and thus sets in a chain reaction for the generation of black money at the wholesale, retail as well as production levels.

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# EFFECT OF ORGANIC AND INORGANIC FERTILIZER ON GROWTH AND YIELD OF INDIAN MUSTARD (BRASSICA JUNCIA L.)

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**ABSTRACT**

**Field experiment was conducted at Crop Research Farm of National Post Graduate College, Barhalganj, Gorakhpur (U.P.) during the rabi season of 2015 – 16 to assess the response of four levels of vermicompost viz No vermicompost, 2 t ha-1 vermicompost , 4 t ha-1 vermicompost , 6 t ha-1 vermicompost and levels of recommended dose of fertilizer viz 50 % of RDF, 75% of RDF and 100% RDF in Randomized Block Design (Factorial) with three replications. The experimental data revealed that application of application of Vermicompost @ 6 t ha-1 vermicompost proved superior in respect of dry matter production, Yield attributes and finally yield significantly. While among the recommended dose fertilizer application of 100% recommended dose of fertilizer proved to be statistically superior in respect of growth, yield attributes and seed yield of mustard.**

***Keywords :*** *Vermicompost, fertility levels, Indian mustard*

## INTRODUCTION

Oil seed the second largest agricultural commodity after cereals in India, play a significant role in Indian agrarian economy sharing 14% of the grass cropped area and accounting for nearly 1.5% of the gross national production and 8% of the value of agricultural products . Mustard seeds are known by different names in different places ex. Sarso, Rai, Toria and Lahi . While Sarso and Toria ( Lahi) are generally termed as Rapeseed and Lahe is known as Mustard.

The country experienced a steep increase in consumption and import of vegetable oil in 1980 promoting the establishment by the government of India of Technology Mission of Oilseed in 1990 to boost production and to accelerate self reliance in vegetable oils. The production of Mustard is not being fully exploited because of lack of proper information about nutritional requirement and combined effect of organic and inorganic fertilizer on Mustard production. The seed yield and oil quality of Mustard can be improved by proper adjustment between organic and inorganic source of nutrient supply . Continuous and sole application of inorganic fertilizer induces the soil sickness and disturb the soil environment to result in low productivity and unsustainability. Continuous application of chemical fertilizer create acidity resulting in phytotoxicity in crops. On other hand organic sources are ecofriendly, improve productivity and sustainability. Vermicompost is a good organic source of plant nutrient supply. It is

rich a source of nitrogen (1.6%), phosphorus (0.54%), potassium (0.80%), Ca, Mg , S, Zn, Fe, vitamins and microbial population. In contrary to synthetic fertilizer , vermicompost reduces soil toxicity by buffering action prevent soil degradation and enhance soil fertility status.

Among different inorganic fertilizer nutrients particularly Nitrogen, Phosphorus and potash constitute major costly production inputs, exploitation of yield potentialities and soil qualities depends how effectively this input is managed. Among the various ingredient for crop production , vermicompost has immense importance and therefore need special attention to exploit full yield potential of the crop in the eastern U.P. Keeping these facts in view the present study was conducted.

**MATERIALS AND METHODS**

The field experiment was conducted at the Crop Research Farm , Barhalganj, Gorakhour (U.P.). The experimental site is situated in sub tropical zone in Indo – Gangatic plains and lies between 260471 North latitude , 820101 East longitude and 1130 m above sea level.The soil of the experimental field was silty loam in texture and slightly alkaline in reaction with PH 7.6, EC 0.20 ds-m organic carbon 0.40 % and available Nitrogen 136 Kg ha-1, Phosphorus 18.4 Kg ha-1 and Potassium 258.42 Kg ha-1 at 0 – 15 cm soil depth. The experiment was laid out in Randomized Block Design (Factorial ) keeping four doses of vermicompost viz No vermicompost, 2 t ha-1 vermicompost , 4 t ha-1 vermicompost , 6 t ha-1 vermicompost and three level of recommended dose of fertilizer viz 50 % of RDF, 75% of RDF and 100% RDF with three replications. The sowing was done in the second week of November. The crop was sown by using a seed rate of 5 kg ha-1 and by maintaining a spacing of 45 x 15 cm uniformity. Vermicompost and recommended dose of fertilizer were applied to the plots as per experimental schedule. The other agronomical cultural practices such as weeding and plant protection measures have been performed as per requisite. The crop was harvested manually at the maturity and grain and straw yields were recorded.

**RESULTS AND DISCUSSION**

**Growth Attributes -**

Different vermicompost doses had a significant effect upon the growth attributes viz plant height(Cm) , number of primary branches per plant, number of secondary branches per plant and dry matter accumulation (g plant-1) during the year of study. The perusal of the data given in Table-1 clearly indicates that the effect of vermicompost was more pronounced with the advancement in crop age. The value of plant height recorded under 6 t ha-1 vermicompost was found to be significant higher than 2 t ha-1 vermicompost.Vermicompost increased the availability of plant nutrient in general and rich in nitrogen content (Patel and Maheshwari 1997) Maximum plant height (209.53 cm ) was attained with the application of 100 % RDF and was significantly superior over the rest of the treatment. Mustard is a heavy feeder oil seed crop of plant nutrient require higher amounts of nutrients which were available more at 100 % RDF ( Gurjar and Chauhan 1997). Moreover, vermicompost helps in better utilization of nutrients. Increasing recommended dose of fertilizer significantly increases the number of primary branches per plant, number of secondary branches per plant and dry matter accumulation (g plant-1) during the study year. 100 % RDF resulted in highest number of primary branches and secondary branches per plant which was significantly superior over rest of the treatments . This might be due to fact that the plants having more height produce more number of primary and secondary branches per plant. The

application of vermicompost may improve the physical environment of the soil. (Dhaka and Satish, 2003 and Thanki et.al. 2004). Dry matter production is the resultant effect of growth characters chiefly plant height, number of primary and secondary branches per plant. Any increase in the values of these traits naturally increase dry matter production. Better nutrition in terms of nitrogen and phosphorus coupled with assured vermicompost resulted in better expression of growth characters.

**Table - 1 : Growth characters of Indian Mustard as affected by Organic and Inorganic Fertilizers**

| Treatment | Plant Height (cm) | Number of Primary Branches Plant $^{-1}$ | Number of Secondary Branches Plant $^{-1}$ | Dry Matter accumulation (g Plant$^{-1}$) |
|---|---|---|---|---|
| vermicompost | | | | |
| Control | 196.86 | 6.50 | 14.84 | 54.00 |
| 2 t ha$^{-1}$ | 203.97 | 7.32 | 15.39 | 60.52 |
| 4 t ha$^{-1}$ | 206.72 | 8.12 | 16.16 | 63.67 |
| 6 t ha$^{-1}$ | 209.53 | 8.43 | 18.09 | 65.83 |
| S.Em | 3.15 | 0.30 | 0.51 | 1.15 |
| C.D. at 5% | 6.40 | 0.61 | 1.04 | 2.34 |
| Fertility Levels | | | | |
| 50% RDF | 195.62 | 0.29 | 15.03 | 54.57 |
| 75% RDF | 208.62 | 7.87 | 16.38 | 62.55 |
| 100% RDF | 208.76 | 8.61 | 16.94 | 66.19 |
| S.Em | 2.72 | 0.26 | 0.44 | 0.99 |
| C.D. at 5% | 5.54 | 0.53 | 0.89 | 2.02 |

**Yield attributes and yield**

The data on yield attributes presented in Table 2 showed that the vermicompost ( 6 t ha-1 ) visualized highest number of siliqua-1 , length of siliqua (Cm) and number of seeds siliqua-1 . Among recommended dose of fertilizer tested 100% of RDF was found significantly superior over all the yield attributing characters than the 50 % of RDF. Yield attributing characters in the plant are the resultant of vegetative development. Favourable vermicompost with adequate nutrient supply in the form of RDF during sowing time and vegetative growth period results in better translocation of photosynthates to developing plant parts for better expression of yield attributes.

Yield is the final outcome of better growth characters and yield attributes. The data given in Table – clearly indicates that 1000 seed weight (g), seed yield ( q ha-1 ) and straw yield (q ha-1 ) during the study was found highest, when supplied with vermicompost ( 6 t ha-1 ) . Likewise application of 100% RDF help the crop to attain the highest yield. Final outcome of crops in terms of yield is a result of coordinated interplay of growth and yield attributing characters.

**Table - 2 : Yield attributes of Indian Mustard as affected by Organic and Inorganic Fertilizers**

| Treatment | Number of Siliqua Plant$^{-1}$ | Length of Siliqua (cm) | Number of seeds siliqua$^{-1}$ |
|---|---|---|---|
| vermicompost | | | |
| Control | 331.82 | 3.64 | 12.19 |
| 2 t ha$^{-1}$ | 340.29 | 3.99 | 13.35 |
| 4 t ha$^{-1}$ | 354.90 | 4.23 | 14.15 |
| 6 t ha$^{-1}$ | 370.57 | 4.69 | 15.05 |
| S. Em | 7.38 | 0.15 | 0.25 |
| C.D. at 5% | 15.02 | 0.33 | 0.50 |
| Fertility Levels | | | |
| 50 % RDF | 331.31 | 3.89 | 12.55 |
| 75 % RDF | 354.62 | 4.15 | 13.99 |
| 100 % RDF | 363.75 | 4.24 | 14.52 |
| S. Em | 6.39 | 0.09 | 0.21 |
| C.D. at 5% | 2.03 | 0.24 | 0.43 |

The inference , from the above study has been drawn that among vermicompost of( 6 t ha-1 ) proved significantly superior in respect of growth attributes, yield attributing characters and finally yield. While among the recommended dose of fertilizer 100% of RDF performed well with respect to growth and yield attributes and gave maximum yield.

**Table -3 : 1000 seed weight(g), Seed yield(q ha-1 ) and Straw yield(q ha-1 ) of Indian Mustard as affected by Organic and Inorganic Fertilizers**

| Treatment | 1000 seed weight (g) | Seed Yield (Q$^{ha-1}$) | Straw yield (q ha-1 ) |
|---|---|---|---|
| Vermicompost | | | |
| Control | 4.60 | 13.25 | 32.99 |
| 2 t ha-1 | 4.86 | 15.06 | 36.55 |
| 4 t ha-1 | 5.13 | 16.58 | 41.25 |
| 6 t ha -1 | 5.49 | 17.45 | 45.42 |
| S. Em | 0.13 | 0.44 | 0.93 |
| C. D. at 5% | 0.27 | 0.90 | 1.90 |
| Fertility levels | | | |
| 50 % RDF | 4.74 | 14.34 | 35.68 |
| 75 % RDF | 5.10 | 15.91 | 39.68 |
| 100 % RDF | 5.22 | 16.51 | 41.80 |
| S. Em | 0.11 | 0.38 | 0.81 |
| C. D. at 5% | 0.23 | 0.78 | 1.65 |

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# INFLUENCE OF SEED TREATMENT ON SEEDLING VIGOUR AND MORTALITY OF BER (ZYZYPHUS SP.)

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**ABSTRACT**

**The experiment was conducted at the Department of Horticulture, Kulbhasker Ashram Post Graduate Collage, Allahabad, Uttar Pradesh with a view to standardize suitable stratification duration and hormone concentration for Ber seed treatment. There were seven treatment combinations ($T_1$ to $T_{10}$) including a control. Different duration of seed stratification i.e., 24hours,48 hours and 72hours were tried along with the 100ppm,200ppm and 300 ppm $GA_3$ seed treatment . Treated seeds were sown in the polythene bags (25x15 cm size, 200gauge thick) containing soil, sand and FYM mixture (1:1:1). It was interesting to note that the effect of stratification duration and hormone treatment concentration was found to be significant for seed germination, transplanting success, seedling mortality percentage and rate of seed germination. Treatment $T_6$ (48hrs+300ppmGA3) yielded highest percentage, (84.00) of seed germination while the lowest percentage value (37.25) was recorded in $T_9$ (72hrs+300ppmGA3) treatment and the transplanting success was also lowest in $T_9$. The seedling mortality percentage was maximum (79.25) with $T_9$ where as lowest percentage value (22.00) was observed for $T_6$ treatment. It may be concluded that $T_6$ treatment can be recommended for the better stand establishment of Ber nursery.**

***Keywords:*** *Stratification, treatment, $GA_3$, nursery, ber , mortality, seedling, germination, seed.*

## INTRODUCTION

Ber seed more resistant to biotic and abiotic stresses. Seedlings of indigenous species have poor buddable size attainability. Their long lasting effect on guava makes orchard remunerative. Increased demand of Ber *(Zyzyphus mauritian)* buddlings in traditional as well as nontraditional areas of India due to its peculiar character of diverse use, medicinal value ,tolerance to biotic and abiotic stresses ,higher benefit cost ratio and positive government policies emphasized to chalk out some feasible and acceptable measures for the better stand-establishment of saplings at the nursery stage. Ber buddlings are prepared thorough budding on seedling root - stock which is obtained through seeds. In nature, Ber seed has poor germination and higher seedling mortality, owing to adverse edaphic conditions during nursery stage. Therefore it becomes imperative to standardize suitable stratification time and exact hormone concentration for seed treatment for flourishing the Ber nursery-industry. Certainly, these tactics are the most important component to provide sound base for propagation, once time and concentration is standardize, we shall be able to grow healthy seedlings with faster rate.

Keeping these aspects in view, the experiment was under taken to ascertain the effect of the stratification and hormone treatment on seed germination, rate of seed germination, transplanting success and mortality of seedlings.

## MATERIALS AND METHODS

The experiment was conducted at the Department of Horticulture, Kulbhasker Ashram Post Graduate Collage, Allahabad, Uttar Pradesh during the year 2017-18 with a view to standardize suitable stratification duration and hormone concentration for Ber seed treatment. There were ten treatment combinations ($T_1$ to $T_{10}$) including a control. Different duration of seed stratification i.e., 24hours, 48 hours and 72hours were tried. Soaked seed were put in layers under different strata of moist sand for varying duration. $GA_3$ hormone @ 100ppm, 200ppm and 300 ppm was used for seed treatment after stratification. Treated seeds were sown in the polythene bags (25x15 cm size, 200gauge thick) containing soil, sand and FYM mixture (1:1:1).

**Table - 1 : Influence of stratification duration and hormone concentration on seed germination and rate of seed germination in Ber *(Zyzyphus sp)*.**

| **Treatments** | **Seed germination (%)** | | | | | | | | ***Rate of seed germination*** |
|---|---|---|---|---|---|---|---|---|---|
| | 3 DAS | 6 DAS | 9 DAS | 12 DAS | 15 DAS | 18 DAS | 21 DAS | 27 DAS | *Mean days taken in seed germination* |
| $T_1$ (24hrs+100ppmGA3) | 2.95 (9.89) | 22.66 (23.29) | 43.33 ( 35. 4) | 48.33 (37.06) | 53.66 (40.92) | 56.00 (45.12) | 56.00 (45.12) | 56.00 (45.12) | 10.43 |
| $T_2$ (24hrs+200ppmGA3) | 3.05 (10.3) | 22.66 (25.29) | 45.33 (38.40) | 50.33 (40.06) | 58.66 (45.92) | 60.00 (50.12) | 60.00 (50.12) | 60.00 (50.12) | 10.25 |
| $T_3$ (24hrs+300ppmGA3) | 3.25 (10.30) | 24.66 (28.29) | 47.33 ( 40.4) | 53.33 (45.06) | 60.66 (48.92) | 61.00 (52.12) | 61.00 (52.12) | 61.00 (52.12) | 10.01 |
| $T_4$ (48hrs+100ppmGA3) | 2.36 (8.83) | 25.66 (30.29) | 49.33 (44.4) | 55.33 (48.06) | 63.66 (52.92) | 64.00 (53.12) | 64.00 (53.12) | 64.00 (53.12) | 11.40 |
| $T_5$ (48hrs+200ppmGA3) | 3.60 (10.82) | 25.66 (30.33) | 51.33 (45.76) | 61.66 (51.75) | 64.66 (53 .5 ) | 65.00 ( 53.72) | 65.00 ( 53.72) | 65.00 ( 53.72) | 11.24 |
| $T_6$ (48hrs+300ppmGA3 ) | 5.63 (13.55) | 27.66 (31.64) | 57.66 (49.41) | 64.00 (51.13) | 83.33 (68.91) | 84.00 (69.35) | 84.00 (69.35) | 84.00 (69.35) | 11.03 |
| $T_7$ (72hrs+100ppmGA3 ) | 2.63 (10.75) | 24.53 (33.21) | 39.85 (39.44) | 42.25 (41.44) | 44.25 (42.44) | 44.25 (42.44) | 45.49 (43.21) | 45.49 (43.21) | 9.24 |
| $T_8$ (72hrs+2 00ppmGA3) | 2.33 (6.75) | 23.53 (30.21) | 39.25 (38.44) | 40.25 (39.44) | 41.25 (40.44) | 41.25 (40.44) | 41.25 (40.44) | 41.25 (42.44) | 9.01 |
| $T_9$ (72hrs+3 00ppmGA3) | 2.23 (5.75) | 22.53 (28.21) | 37.25 (37.44) | 37.25 (37.44) | 37.25 (37.44) | 37.25 (37.44) | 37.25 (37.44) | 37.25 (37.44) | 8.25 |
| $T_{10}$ (control) | 2.53 (8.75) | 20.53 (23.21) | 33.25 (32.44) | 43.12 (39.21) | 48.00 ( 41.04) | 49.54 (42.32) | 50.74() (43.49) | 50.74 (43.49) | 15.52 |
| C.D. at 5% | 2.01 | 3.24 | 3.11 | 2.89 | 2.75 | 3.01 | 3.01 | 3.01 | 2.36 |

Note: figures in parentheses are average transformed value.

**Table - 2 : Influence of stratification duration and hormone concentration on seedling mortality and transplanting success in Ber *(Zyzyphus sp*)**

| Treatments | *Seedling mortality (%)* | | | | | *Transplanting success (%)* |
|---|---|---|---|---|---|---|
| | 28 DAS | 35 DAS | 42 DAS | 49 DAS | 56 DAS | |
| $T_1$ (24hrs+100ppmGA3) | 12.00 (22.30) | 23.09 (32.04) | 28.93 (34.91) | 35.01 (38.03) | 35.01 (38.03) | 74.43 |
| $T_2$ (24hrs+200ppmGA3 ) | 11.00 (21.30) | 21.09 (30.04) | 26.93 (32.91) | 30.91 (34.03) | 30.01 (34.03) | 75.25 |
| $T_3$ (24hrs+300ppmGA3 ) | 10.99 (21.10) | 20.89 (29.94) | 26.63 (32.81) | 30.01 (33.93) | 30.01 (33.93) | 76.01 |
| $T_4$ (48hrs+100ppmGA3) | 8.99 (20.10) | 19.99 (29.64) | 25.66 (31.41) | 29.00 (33.13) | 29.00 (33.13) | 79.40 |
| $T_5$ (48hrs+200ppmGA3 ) | 8.63 (19.55) | 19.66 (28.64) | 24.66 (30.41) | 26.00 (32.13) | 28.00 (32.13) | 81.24 |
| $T_6$ (48hrs+300ppmGA3 ) | 7.63 (15.55) | 17.66 (24.64) | 20.66 (27.41) | 22.00 (28.13) | 22.00 (28.13) | 91.03 |
| $T_7$ (72hrs+100ppmGA3 ) | 45.63 (39.75) | 48.53 (40.21) | 50.85 (43.44) | 58.25 (52.44) | 58.25 (52.44) | 49.24 |
| $T_8$ (72hrs+2 00ppmGA3) | 58.33 (51.75) | 62.53 (55.21) | 65.25 (57.44) | 68.25 (58.44) | 68.25 (58.44) | 39.01 |
| $T_9$ (72hrs+3 00ppmGA3) | 62.23 (55.75) | 69.53 (58.21) | 77.25 (62.44) | 79.25 (65.44) | 79.25 (65.44) | 35.25 |
| $T_{10}$ (control) | 46.63 (39.95) | 49.53 (41.21) | 51.85 (44.44) | 59.25 (53.44) | 59.25 (53.44) | 65.52 |
| C.D. at 5% | 2.31 | 3.54 | 3.42 | 3.89 | 2.95 | 4.43 |

Note: figures in parentheses are average transformed value.

## RESULTS AND DISCUSSION

Seed germination in Ber started after 3 days of seed sowing and completed within 27 days in all the treatment. Seed germination under different treatments ranged between 37.25 to 84.00 percent. The percentage of seed germination as influenced by treatments differed significantly The maximum seed germination (84.00 %) was recorded in treatment $T_6$ (48 hrs stratification+300 ppm $GA_3$ ) which was significantly superior to all other treatments and the value was lowest (37.25%) in $T_9$ (72 hrs stratification+300 ppm $GA_3$ ). The findings of the study supported and corroborated the findings of Bisla *et al.,* (1984) in Ber and Govind and Chandra, (1993) in Khasi Mandrin. The lowest percentage of seed germination obtained with treatment T9 indicated adverse effect of longer duration of stratification coupled with toxic concentration GA3 which augmented seed decay and partial damage of seed too. Over tendering of seed coat and ultra concentration of GA3 might be corroded the plume and radicle of the seed resulting failure of germination. The possibility of exo-osmosismay not be denied. Dewey, (1960); Paliwal & Gandhi

(1968) and Ayers and Westcot (1976) also observed the same causes.

There was insignificant difference on the rate of Ber seed germination as it was conspicuously influenced by various duration of stratification and seed treatment. However, the faster rate of seed germination was recorded in T9 (72 hrs stratification+300 ppm GA3 ) i.e.8.25 mean days followed by T8 (72 hrs stratification+2ppm GA3 ) i.e.,9.01 mean days). The slowest rate of seed germination was recorded T10 (control) i.e., 15.52 mean days). Similar result were also recorded by Bahuguna and Pyarelal, (1993) in case of *Acacia*. There was a noticeable and significant effect of treaments on transplanting success. All those treatments respond poor in seed germination also were poor in transplanting success. Though seeds were sown in polythene bags and gently transplanted into the field.

The differences due to various treatments in respect of seedling mortality differed significantly The mortality of Ber seedling range between 22.00 to 79.25 per cent within 56 days of seed sowing.The highest mortality was recorded (79.25%) in $T_9$ (72 hrs stratification+300 ppm $GA_3$ ).followed by 68.25 per cent in $T_8$ (72 hrs stratification+200 ppm $GA_{3)}$ and the value was lowest (22.00%) in $T_6$ (48 hrs stratification+300 ppm $GA_{3)\ treatment}$. Similar results were also found by Awang and Hamzah (1986) in *Acacia*. Ber seed soaking more than 48 houres was proved detrimental in terme of seed germination and mortality Therefore soaking hours should not constitute more than 48 hours to achieve better survival of Ber seedlings. Obviously, more leaching had toxic effect of hormone on tender seedlings and higher osmotic pressure, imbalanced nutrient level lead to mortality of the seedlings The findings are in the conformity of the findings of the Sharma *et al.,* (1984) and Gupta,(1989).

Based on the result obtained from investigation it can be concluded that seed soaking for 48 hours followed by 300 ppm seed treatment with $GA_3$ resulted best performance with regards to percent seed germination (84.00%) and least seedling mortality (22.00%). of Indigenous ber.

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# EFFECTS OF MICROBIAL AND CHEMICAL FERTILIZERS ON VEGETATIVE AND REPRODUCTIVE CHARACTERISTICS OF COMMON DAISY (*BELLIS PERENNI*S L.) cv. Golden Local.

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**ABSTRACT**

**To study the influence of organic and inorganic on quality and yield components in tomato to boost the productivity potential combined application microbial and chemical fertilizers had a great influence at all the growth stages of the crop. Significant differences in all parameters like, plant height, number of leaves, leaf area and number of branches due to the combined application of microbial fertilizer and chemical fertilizer. Maximum plant height (65.23 cm) was observed in Treatment-5 containing NPK+ Phosphobacteria (each 7g / pot). The maximum number of flowers (37.25) per plant was produced in T5 treatment and the maximum number of flower s (27.25/plant). The highest number of branches per plant (26.25) was recorded in treatment T5. Highest flower weight was observed in T5 was (122.23g) Total number of leaf observed 185.33 per plant was observed in T-5, and leaf area fairly gives a good idea of photosynthetic capacity of the plant. Significant differences were noticed with regard to leaf area index among the treatments at all growth stages.**

***Keywords :*** *DAP, NPK, urea azospirillum, phosphobacteria, chemical fertilizer and daisy*

## INTRODUCTION

DAISY (*Bellis perenni*s L.) cv. Golden Local is well responsive to nutrition and found to have great variability with varieties ,climatic conditions and soil fertility. It,s voracious feeder trait may be utilize to maximize productivity. It belongs to family ASTERACEAE . Plant is herbaceous, annual with erect or semispreading in habit. It also behaves like a herb. It is popular vegetable and is native of Europe. It can be grown throughout the year in almost all the states of India except at higher altitudes. The important growing countries in the world are

India, Bangladesh, Pakistan, China, Cyprus, Egypt, Japan, Philippines, Syria and Western Europe (Anon 2001). In India, major producing states are Orissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh (Anonymous, 2004). The varieties show a wide range of flower colour ranging from white, yellow, red with varying shades . It is quite high in aesthetic value and can be well compared with any flower . Farmers may boost-up their socio-economic status by growing it if assured and remunerative yield obtained from this crop.

## MATERIALS AND METHODS

The experiment was carried out in a Completely Randomized Block each unit Design

(CRBD) at the Department of Horticulture, Kulbhasker Ashram Post Graduate College ,Allahabad during the year 2016-17. The mechanical compositions, physical and chemical properties of experimental soil, which was used for pot culture study. The soil physical and chemical properties such as pH, Nitrogen (Jackson, 1958), Phosphorus (Jackson, 1958) and potassium (Peach and Tracey,1956) contents were analyzed. The raised seed bed of 3x1.5m size was prepared,and Tomato seeds were sown in one centimeter depth in the rows spaced at 7 cm and covered with thin layer of FYM. 25days seedlings were transplanted to the trial pot. The treatments, were T-1 DAP+ Azospirillum (7g / pot),T-2 DAP+Phosphobacteria (7g / pot), T-3 DAP+Potassium mobilizer (7g / pot),T-4 NPK Mixture +Azospirillum (10g /pot), T-5 NPK mixture +Phosphobacteria (7g / pot), T-6 NPK mixture +Potassium mobilizer (7g / pot), T-7 Urea+ Azospirillum (each 7g /pot), T-8 Urea+ Phosphobacteria (each 7g / pot), T-9 Urea+ Potassium mobilize (7g / pot), T-10 Urea ( Control). (each 7g / pot) . Five plants were selected randomly from plot to record yield contributing characters. All practical managements included; mulching, weeding and other agronomic treatments were done mechanically. Irrigation was done based on plant requirements. In maturity time, flower yield, number of flower per plant, total plant height, shoot length, root length, number of branches per plant, number of leaves and leaf area per plant were measured. The collected data were analyzed statistically by F-test to examine the treatment effects and the mean differences were adjudged by Duncans Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

**RESULTS AND DISCUSSION**

The present study was observed that the application of microbial and chemical fertilizers combined application had a great influence at all the growth stages of the crop. Significant differences in all parameters like, plant height, number of leaves, leaf area and number of branches due to the combined application of microbial fertilizer and chemical fertilizer. Maximum plant height (65.23cm) were observed in T5 (Table1). The data on shoot length (36.25cm), and root length (51.25cm) as influenced by the combination of biofertilizers and chemical fertilizers showed significant differences among the treatments at all the stages. The highest number of branches per plant (26.25nos) was recorded in treatment T5 . Highest fruit weight was observed in T5 (122.23g) Total number of leaf observed 185.33 per plant was observed in T-5,and leaf area fairly gives a good idea of photosynthetic capacity of the plant. Significant differences were noticed with regard to leaf area index among the treatments at all growth stages. The treatment 5 showed significantly higher leaf area (1720.23 cm2).The increase in leaf area index could be attributed to increased cell division and elongation resulting in increased leaf expansion, more number of leaves due to beneficial influence of biofertilizers which release growth promoting substances and enhances the availability of nitrogen. From the data it appeared that flowering and fruiting of tomato were positively influenced by sources of nutrients applied. The maximum number of flowers (37.25/plant) per plant was produced in T5 treatment and the maximum number of flowers (18.33/plant).Similar results were also reported by Naidu et al., (1999) revealed that the morphological parameters were affected significantly due to the application of different combination of organics, chemicals and biofertilizers.Nitrogen fertilizer use has played a significant role in increase of crop yield (Modhej et al., 2008). Significant increase in plant height, number of leaves, number of branches and

number of flowers due to influenced by environmental conditions and management practices. Prabhu et al., (2003) their studies indicated that plant height is increased by the application of organics and biofertilizers, attributed to the increased uptake of nutrients in the plants leading to enhanced chlorophyll content and carbohydrate synthesis and increased activity of hormones produced by *Azospirillum* and phosphate solubilizing bacteria.The Phosphobacteria increased phosphate availability in soils which in turn helped better proliferation of root growth and uptake of other nutrients to the greater extent. So that the enlargement in cell size and cell division, which might have helped in plant height, number of leaves, branches number of flowers per plant. These results are in agreement with those reports of Nanthakumar and Veeraraghavathatham(2000), Anburani and Manivannan (2002),and Wange and Kale (2004). Fundamentally, K+ is very water soluble and highly mobile and transported in the plants xylem (Lack and Evans, 2005). Membrane transport of potassium can be mediates either by potassium channels, utilizing the membrane potential to facilitate transport of potassium down its electrochemical gradient,or by secondary transporters . In plants,potassium act as regulator since it is constituent of 60 different enzyme systems of drought tolerance and water-use efficiency. In addition, current study has showed that to optimum growth, crops need more potassium than needed (Simonsson et al., 2007)Aminifard et al., (2010) with study responses of eggplant to different rates of nitrogen under field conditions were reported that fertilization with 100 Kg/ha nitrogen resulted in the highest average fruit weight and fruit yield. Pal et al., (2002) were reported that eggplant fruit yield increased with increase in nitrogen up to187.5 kg/ha. Only microbial treated plants could not increase the vegetative growth of plants and the reason may be that they released nutrients at a slower rate. On the other hand,the only application of inorganic fertilizer was also less effective than the combined application. These results were inconformity with the findings of Rahman etal. (1998) found that the vegetative growth and yield of berry was the highest with the combined application of manures andfertilizers. For Daisy , the integrated use of urea and poultry manure also resulted in a higher nutrient uptake Jose et al., (1988).The use of synthetic fertilizers causes a great impact on the environment and the cost of these fertilizers is increasing over the years.The farmers need to raise the crops by organic farming that will reduce the costs and will decrease the impact on the environment.

In addition, organic farming will reduce the additional burden of environmental pollution that is caused while manufacturing these synthetic fertilizers at the source (Rathier and Frink, 1989). Now it is a well established fact that organic fertilizers provide enough requirements for proper growth of the crop plant and may enhance the uptake of nutrients, increase the assimilation capacity and will stimulate the hormonal activity as well (Tomati et al., 1990). The use of biofertilizers useful as it increases soil porosity, aeration and water holding capacity, therefore a practically paying proposal. Azospirillum, a nitrogen fixing organism has been reported to be beneficial and economical on several crops.They improve the growth and yield as well as productivity of the crop. Vanangamudi et al., (1989) also reported similar increase in per cent germination and shoot length with increase in nitrogen application (0 150 kg/ha). Prabhu et al. (2003) reported that increased N and P rates increased the plant height, branch number per plant phosphate solubilizing Bacteria (PSB) are a group of

beneficial bacteria capable of hydrolysing organic and inorganic phosphorus from insoluble compounds. Chen et al., (2006) P-solubilization ability of the microorganisms is considered to be one of the most important traits associated with plant phosphate nutrition P-solubilizers are biofertilizers which solubilizes the fixed phosphorus in soil and makes it available for plants. The microbes, *Fraturia aurantia* belonging to the family *Pseudomonaceae*, is a beneficial bacteria capable of mobilizing potash to plants in all types of soil especially, low K Content soil. Such bacterial population in the soil form can increase the availability of potash to the plants. Wange and Kale (2004) reported that, the results revealed significant improvement in vegetative characters such as plant height and number of leaves per plant over the recommended biofertilizer with combine chemical fertilizer. The information on the role of organics on morphophysiological traits is meager. Hence, there is a need to study the influence of organic and inorganic on quality and yield components daisy to boost the productivity potential.

The cost of inorganic fertilizers has been enormously increasing to an extent that they are out of reach of the poor, small and marginal farmers. It has become impractical to apply such costly inputs for a crop of marginal returns. The use of biofertilizers in such situation is therefore a practically paying proposal. Based on the above results, it was concluded that, the application of microbial and chemical fertilizers was found more beneficial and significantly improved morpho-physiological traits, growth parameters, and yield components in daisy. The benefit cost ratio was found lesser in using both biofertilizer and chemical fertilizer compared to using chemical fertilizer alone in daisy crop cultivation.

**Table - 1 : The effect of microbial and chemical fertilizer on vegetative characteristics of Daisy plant.**

| Treatments | Plant height(cm) | Shoot length (cm) | Shoot /plant(no) | Leaves/plant (cm) | Leaf area/plant (cm2) | Root/plant (no) | Root length (cm) |
|---|---|---|---|---|---|---|---|
| $T_1$ | 50.11 | 20.01 | 12.21 | 120.12 | 1110.21 | 11.20 | 30.25 |
| $T_2$ | 52.33 | 22.41 | 14.24 | 142.01 | 1320.25 | 13.22 | 32.22 |
| $T_3$ | 51.12 | 21.01 | 13.21 | 130.11 | 1201.22 | 12.02 | 31.02 |
| $T_4$ | 62.21 | 32.01 | 23.10 | 162.21 | 1500.20 | 22.23 | 52.36 |
| $T_5$ | 65.23 | 36.25 | 26.25 | 185.33 | 1720.23 | 25.14 | 55.65 |
| $T_6$ | 61.51 | 33.41 | 24.00 | 154.00 | 1445.01 | 23.02 | 51.25 |
| $T_7$ | 45.44 | 30.00 | 9.25 | 95.33 | 950.23 | 8.35 | 35.36 |
| $T_8$ | 48.25 | 31.02 | 10.23 | 100.23 | 1000.25 | 9.36 | 38.44 |
| $T_9$ | 46.21 | 29.22 | 9.89 | 96.65 | 960.56 | 8.55 | 36.25 |
| $T_{10}$ | 36.23 | 15.64 | 5.54 | 55.65 | 565.85 | 4.56 | 25.68 |
| MSE+_ | 8.25 | 4.22 | 2.14 | 12.02 | 45.36 | 1.20 | 3.36 |

**Table - 2 : The effect of microbial and chemical fertilizer on reproductive characteristics of Daisy plant**

| Treatments | Anthesis time (DAP) | bud/plant (no) | Flower opening/plant (no) | Full bloom /plant (kg) | Single Flower weight (g) | Flower yield/plant (kg) | Flower yield (Q/ha) |
|---|---|---|---|---|---|---|---|
| $T_1$ | 70.11 | 21.01 | 13.21 | 10.12 | 60.21 | 1.100 | 330.25 |
| $T_2$ | 72.33 | 23.41 | 15.24 | 142.01 | 82.25 | 1.320 | 332.22 |
| $T_3$ | 71.12 | 22.01 | 14.21 | 13.11 | 70.22 | 1.200 | 331.02 |
| $T_4$ | 66.21 | 33.01 | 24.10 | 16.21 | 100.20 | 2.230 | 552.36 |
| $T_5$ | 65.23 | 37.25 | 27.25 | 18.33 | 122.23 | 2.540 | 555.65 |
| $T_6$ | 66.51 | 34.41 | 25.00 | 15.00 | 114.01 | 2.320 | 551.25 |
| $T_7$ | 75.44 | 31.00 | 10.25 | 9.33 | 95.23 | 0.830 | 335.36 |
| $T_8$ | 78.25 | 32.02 | 11.23 | 10.23 | 100.25 | 0.930 | 338.44 |
| $T_9$ | 76.21 | 30.22 | 10.89 | 9.65 | 36.56 | 0.850 | 336.25 |
| $T_{10}$ | 96.23 | 16.64 | 6.54 | 5.65 | 16.85 | 0.456 | 225.68 |
| MSE+_ | 9.25 | 5.22 | 3.14 | 1.02 | 4.36 | 0.120 | 33.36 |

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# EFFECT OF MEDIA AND SUBSTRATES FOR SPAWN PRODUCTION OF DHINGRI MUSHROOM (PLEUROTUS OSTREATUS)

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**ABSTRACT**

**The Pleurotus mushrooms are cultivated throughout the world. These mushrooms have high nutritional as well as medicinal value. The present investigation was carried out to find the best medium for pure culture preparation and best cereal grains for suitable spawn production. For preparation of pure culture six media viz., Potato Dextrose Agar (PDA), Malt Extract Agar (MEA), Wheat grain extract agar (WGEA), Corn Meal Agar (CMA), Carrot root extract agar (CREA) and Rice bran decoction agar (RBDA) were used. Out of six locally available substrates evaluated for spawn production. Among all the media the best mycelial growth was occurred on Potato Dextrose Agar. For spawn preparation six types of locally available cereal grains viz., Sorghum, pearl millet, wheat grain, rice grain, maize grain and pea grain gave significantly maximum growth and were statistically at par with one another and proved as best substrates for spawn production.**

***Keywords:*** *Media, mycelial growth, spawn, substrates, pleurotus ostreatus*

## INTRODUCTION

Oyster mushroom is an edible fungi belonging to the genus *Pleurotus* comes under the class Basidiomycetes and having outstanding flavor and taste. The significance of mushroom in the agrarian financial system of the world needs no emphasis because of its nutritional and medicinal value. *Pleurotus* sp. are very popular and widely cultivated throughout the world mostly in Asia and Europe owing to their simple and low cost production technology and higher biological competence (Mane *et al*, 2007). It can grow on wide range of agricultural wastes, having short cropping periods and ability to grow on wide range of temperature and humidity compared to other cultivated mushroom. Throughout the rainy season, edible and non-edible species of mushrooms commonly grow on different natural materials such as garden loam, decaying wood, termite nest, tree trunks, under the shade provided by trees; leaf litters, tea, coffee and rubber plantations etc. Wildly growing mushrooms are considered as well nutritious food which contains protein, amino acids, vitamins, crude fiber, lipids, sugars, glycogen and important mineral contents, which are necessary for normal performance of the human body (Gbolagade

*et al*, 2006).

Mushroom growth is extremely influenced by numerous factors such as spawn, growing media, pH, temperature, moisture content and light intensity (Kadiri and Kehinde, 1999). Spawn is the seed of mushroom, comparable to the vegetative seed in crop plants. It is merely the vegetative mycelium from a selected mushroom grown in a convenient medium or grains. Therefore, spawn comprises of mycelium of the mushroom and a supporting substrate medium that provides nutrition to the fungus during its mycelia growth. It can be prepared on any kind of cereal grains and agricultural wastes. Spawn (active mycelium) production is one of the most important factors to mushroom cultivation throughout the world (Stanley, 2010).

Successfully production of mushroom and higher yield of quality mushroom depends upon proper maintenance of pure culture as well as purity and quality of the spawn used. Hence, low-cost and quality spawn is the basic requirements for mushroom growers. Keeping in view the significance of suitable medium and the substrate in the preparation of good quality spawn, the present study has been carried out with six different media and six substrates for estimation to find out the best media and substrates for mycelial growth in spawn production.

## MATERIALS AND METHODS

These medium is used as a substrate for isolation, multiplication, preservation and maintenance of mushroom cultures. To find out the best culture medium for mycelial growth of the *Pleurotus ostreatus*, six different culture media *viz*., potato dextrose agar, malt extract, corn meal agar, carrot root extract agar, wheat grain extract agar and rice bran decoction were prepared by standard methods. The various constituents of these media were integrated as- potato dextrose agar (peeled potato 200 g, dextrose 20 g, Agar-agar 20 g, water 1000 ml), carrot root extract agar medium (carrot root 200 g, Agar-agar 20 g, dextrose 20 g, water-1000 ml), corn meal agar (corn meal 20 g, dextrose 20 g, Agar-agar 15 g, water 1000 ml), malt extract agar (malt extract 25 g, peptone 5.0 g, Agar-agar 18 g, water 1000 ml), rice bran decoction medium (rice bran 200g, Agar-agar 20g, dextrose 20g, water 1000 ml) and wheat grain extract agar (wheat grain 32 g, dextrose 20 g, Agar-agar 20 g, water 1000 ml).

The different constituents of media were dissolved in water separately. In case of potato dextrose agar, carrot root extract agar, rice bran decoction medium and wheat grain extract, extraction was taken after boiling them on a water bath. All the media were sterilized in the autoclave at 121 °C for 20 minutes. The pH of the medium adjusted by adding N/10 NaOH or N/10 HCl drop by drop to raise it to 7 or brought down to be adjusted to 7.0, respectively before sterilization. After sterilization the tubes were put in slanting position for slant preparation or pouring the medium in sterilized Petri-dishes subsequently cooling at room temperature. The glass-wares were cleaned with chromic acids and distilled water was used during entire media study. All the Petri plates and other glass wares were sterilized in hot air oven at 160°C for 120 minutes before pouring the medium. A set of three Petri dishes of 9.0 cm diameter was maintained for each treatment. About 20 ml. sterilized, melted but cooled medium was aseptically poured in each Petri dish. The Petri dishes were handled aseptically in a sterilized inoculation chamber using a sprit lamp flame in the chamber. The medium in the plates was allowed to solidify before inoculation with mushroom culture.

In order to find out the best substrate for spawn preparation, six substrates, *viz*., sorghum

grain, pearl millet grain, wheat grain, maize grain, pea grain and rice grain were used for spawn production. Spawn of all tested substrates were prepared by following Upadhyay *et al.* (2004). Selected substrates were cleaned and boiled in water till they soften and then spread on the polythene sheet under shade for draining excess water from grain surface, then after in each substrate was mixed with calcium carbonate @ 0.5% and calcium sulphate @ 2%. The mixed grain was filled in 20 cm long test tubes up to 12 cm volume and plugged with non absorbent cotton and autoclaved at 15 psi for 1.5 hours. After cooling these autoclaved test tubes were left in the room temperature for 24 hours, so that they are cooled to ambient temperature. A bit of mushroom mycelium was aseptically transferred in to these test tubes and inoculated at $24^0$C temperature. This experiment was repeated for five times. The down ward linear growth of the mycelium of each substrate was noted after 7 days of incubation.

## RESULTS AND DISCUSSION

The result of the analysis of variance showed that mycelial growth on different solid media exposed that potato dextrose agar medium supported the maximum mycelial growth of *Pleurotus ostreatus* and was found significantly superior over rest of the media tested (Table 1 and Fig.-1). Good growth was recorded on malt extract agar medium. Fair mycelia growth was recorded on wheat grain extract agar, corn meal agar, carrot root extract agar and rice bran decoction agar whereas all other tested media supported poor mycelial growth. The mycelial growth of all the tested media was significantly different from one another. The similar results were found in the studies of (Sardar *et al*, 2015) Potato dextrose agar proved to be the best media for the mycelial growth of *Pleurotus* species. Khandakar *et al*, (2008) observed maximum mycelial growth of *P. citrinopileatus* on corn meal agar. However mycelial growth of fungus is highly effected by changing the contents of media Chang and Miles (2004).

**Table - 1 : Effect of different solid media on the mycelial growth of *Pleurotus ostreatus* at 24±1°C**

| S. No. | Media | Mycelial Growth (mm) |
|---|---|---|
| 1. | Potato dextrose agar | 8.960 |
| 2. | Malt extract agar | 8.820 |
| 3. | Corn meal agar | 6.540 |
| 4. | Carrot root extract agar | 6.400 |
| 5. | Wheat grain extract agar | 6.700 |
| 6. | Rice bran decoction agar | 4.520 |
| | **SE(d)** | 0.163 |
| | **C.D. at 5%** | 0.339 |

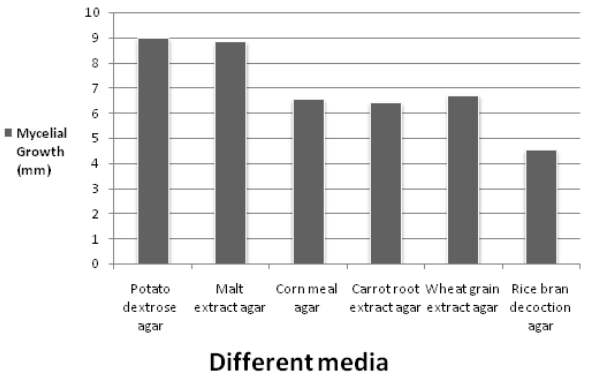


**Fig.-1: Effect of different solid media on the mycelial growth of *Pleurotus ostreatus* at 24±1°C.**

Six types of substrates having five replicates were used for determination of linear mycelial growth *Pleurotus ostreatus* that the sorghum grains was taken minimum days for completing the mycelial run followed by pearl millet, wheat grain, rice grain, maize grain and pea grain (Table 2 and Fig.-2). Hence, sorghum grain proved best over all other grains used for spawn

production. All kinds of grains used as substrates for spawn production show significantly differences from one another. It was also relevant from the table that the pea grain supported poor vegetative growth of *Pleurotus ostreatus*. Thulasi *et al*, (2010) observed that sorghum grain was significant substrate for the preparation of spawn of *P. florida* and *P. eous*. The sorghum grains usage all over the world for the preparation of spawn of oyster mushroom Oei and Nieuwenhuijzen (2005). The sorghum, wheat, barley and maize grains are used for spawn preparation in industrial level of edible mushroom (Sharma *et al*, 2006).

**Table - 2 : Evaluation of the different substrate for spawn production of *Pleurotus ostreatus***

| S. No | Substrates | Spawn Production (Days) |
|---|---|---|
| 1. | Sorghum | 9.40 |
| 2. | Pearl millet | 11.00 |
| 3. | Wheat grain | 12.00 |
| 4. | Maize grain | 13.60 |
| 5. | Pea grain | 16.00 |
| 6. | Rice grain | 12.40 |
| | SE(d) | 0.927 |
| | C.D at 5% | 1.925 |

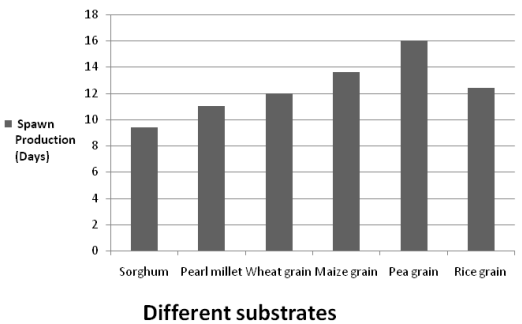


**Fig.- 2: Effect of the different substrate for spawn production of *Pleurotus ostreatus***

## CONCLUSION

From the present investigation it is fulfilled that for preparation a best culture the potato dextrose media (PDA) and malt extract agar media (MEA) is the best as compared to other culture media. Out of six grains, the best mycelial growth was found on sorghum grains. The present results are in evenness with the presented literature of a variety of spawn substrates used by former workers.

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# FRONTIERS IN MILK HARVESTING STYLES IN COWS AND BUFFALOES

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**ABSTRACT**

**Ever since harvesting the milk from cows and buffaloes has always been an arena of importance, curiosity and interest to dairy farmers. Many ways of milking have been developed by man to mimic natural suckling act of the calf, who is the natural customer of milk present in cow's udder. However, each of these procedures has certain merits as well as limitations. Present concept paper describes how a calf could be used to harvest the milk from cow's udder in most natural manner and can replace milkers and machines both, can be used anytime and anywhere, without electricity and that too in most hygienic manner.**

***Keywords :*** *Milk, harvesting, cows, buffaloes.*

## INTRODUCTION

India possesses maximum number cows and buffaloes in the world and her countrymen rear them mainly for harvesting their milk. However, in some areas these animals are also reared purely to raise their progeny. In this practice entire milk of cow is allowed to be suckled by her calf for at least initial 3-4 months for its excellent growth. Such practice is seen in remote tracts of pride breeds, like Kankrej, where bullock power has been valued much for farming/ draft purpose. However, with advancement of time and mechanized farming this practice has been fading away.

Normally, milk synthesised in the udder is made available as a consequence to normal calving, for nursing the young calf. Normal calving is also a pre-requisite to obtain optimum milk yield for normal lactation period, which should continue for about 305-days (Fig. 1). In rare instances milk could also be obtained without calving, and such practices are described elsewhere as '*prenating'* in normal and '*induction of lactation'* in reproductively problematic/ infertile females. Both these practices are unnatural and hence, not gaining popularity.

By nature, milk in udder is meant for new born calf till its dependence on coarser feeds. Release of calf towards dam not only promotes milk let-down but it also forms a natural bonding between the two, which is overtly reflected by her licking (owning) and guiding the calf as well as orienting her hindquarters in a way as to assist the young reaching to a point to grasp her teats (Fig.2). This could be a divine example of faithfully '*offering'* the produce to the '*natural customer, the calf*', whenever demand is felt by him/ her. Reports whether such bonding helps in better growth and development of

the calf are scanty in literature.

This harmonious act, under the influence of oxytocin hormone, between the cow and calf if allowed to go uninterrupted, could be completed in surprisingly shortest possible time. Therefore, probably in this manner the milk production from the cow could be recorded highest during the lactation period than if the cow is milked otherwise (by hand or machine). If so, the calf could be adjudged as best harvester of milk. Reports on such comparative studies are also scanty in literature.

**Fig.-1: Calving, an essential act, to ensue normal lactation**

**Fig.-2: Cow supporting her calf for harvesting milk**

With advancement of time man has progressively learnt and improved skills to milk cows and buffaloes for his use by minimizing share of the actual customer i.e. calf. Milk production potential of cows and buffalos has also been increased steadily over the past using various selection methods and breeding tools. Now, a stage has been reached where milk producing potential of cows and buffaloes is much beyond the requirement of the calf. This is seen in commercial dairy farms who keep high producing stock, most of them don't require presence of calf for milk let down. Consequently, such farms practice weaning of calves right from their birth and provide them colostrums/ milk separately. This practice puts more selection pressure on calves as herd replacers.

In other kinds of commercial dairy farms, calves are not at all required to be raised for milk let-down or suckling. A dummy calf is kept ready by stuffing the dead calf's skin with straw, etc. and is pulled near to the cow/ buffalo during milking time. Such dummy calves once prepared remain in use for long. Such farms harvest entire milk from the cow's udder for their use. This practice is also sometimes seen when calf dies accidentally and dam doesn't let down the milk without calf in rural India.

In our country there are still a large number of small sized dairy farms where milk production is not at commercial scale and their dairy stocks are either low or medium producers. At such farms calves are generally employed mainly for milk let-down of their dams. Calves at these farms may not be getting their dues as they deserve, due to low milk potential of their dams.

**Hand Milking**

Soon after milk let-down the cows and buffalos are subjected to milking, either by hand or machine. Cows are generally soft milkers, some high yielders of them may have even leaky teats, where as buffaloes may be hard milkers (Fig. 3, 4). Due to the initial faulty trainings and/ or due to hard

teats, the milker may adopt knuckling procedure for milking, which is unscientific as it leads to teat's tissue damage and mastitis. Other milking procedures, depending mainly upon size of the teats, include stripping and full hand milking. These are scientific procedures and thus recommended throughout for the health of teats. It is observed that a person can milk about 12 cows twice a day by hand milking. During hand milking cow/ buffaloes may get used to a specific milker, milking style and the environmental stimuli. Some of them may develop vices during milking, like lifting the limb, kicking milker/ pail, moving away, repeated moving the tail, arching the back to suck the milk, etc. Whereas, sometimes in high yielders milker remains unable to milk the cow/ buffaloes completely and there is significant amount of milk left over in the udder. All this may lead to incomplete harvesting of milk, mastitis and economic loss.

**Fig. -3 : Hand milking by one milker**

**Fig. - 4 : Hand milking by two milkers for faster milking**

**Machine Milking**

With increasing urbanization cost of farm labour is becoming high and such hands are not now as easily available in rural areas as used to be in the past. This picture is true with milkers also, who are skilled workers. Hence, finding a suitable milker, in urgency, can be a difficult task particularly when already employed milker leaves the job suddenly. Otherwise also the milkers some time may pose problem when they are in groups and pressurize the entrepreneur on to their demands. So the places where herd size is large and experiences frequent milkers' problem, machine milking remains the only option to switch over (fig. 5).

**Fig. - 5 : Machine milking for individual cows**

**Fig. - 6 : Machine milking for a group of cows**

When entrepreneur considers installing the machine milking, there are only a few genuine

suppliers available in the market. Such automated milking units vary in their capacity to milk different sized dairy herds. For fixed units their installation is costly and requires constant supervision and regular maintenance (Fig. 6). Their spare parts are also costly. Due to these limitations, each and every dairy farmer can't think of installing milking machine.

During machine milking cows are forced to stand in/ pass through unnatural enclosures/ stalls/ passages and see unrelated machineries and installations, which are of no use or likings to them with respect to their natural instinct and welfare. Sometimes, cows may not get properly adapted to such a system and may develop vices, injuries and problems in log run like mastitis, broken/ pendulous/ fibrous udder, etc. Besides in cows and buffaloes, machine milking is slowly getting adopted in other species like goats and camel.

**Criteria for ideal milking procedure**

In view of the above discussion, presently there seems no other way out except hand milking and machine milking for milking cows and buffaloes. Both of these procedures have merits as well as limitations. However, the best milking procedure should meet the following criteria:

1. Milking act should be close to natural suckling behaviour of the calf
2. Cow/ buffalo should enjoy the milking act
3. Milking can be performed anytime and anywhere, even without power/ electricity
4. It should lead to hygienic milk production
5. It should be able to perform complete harvesting of milk
6. It should not allow to develop any vice, injury or disease to udder or teats
7. It should avoid transmission of disease from man to animal and *vice-versa*
8. It should be cost effective

By critically looking into the above milking criteria, there could be some new means other than hand milking and machine milking that satisfies maximum criteria for harvesting the milk from the cow's udder.

**Muzzlo-Buccal Adapter (MB Adapter)**

*"Since calf is the natural customer of the milk present in the udder of cow and remains supported and gets sincere cooperation of the mother in any kind of environment, it could be employed not only for milk let down but also for hygienic and speedy harvest of milk".*

In order to accomplish this act, a specially designed disposable plastic '**Muzzlo-Buccal Adapter (MB Adapter)**' is required to be developed (Fig. 7). This MB adapter will have following parts:

1. Muzzle ring (MR) to fit over muzzle round behind external nares and chin groove
2. Two slots to fit over external nares (NO)
3. Balloon shaped buccal body (BBC; 5-7 cm diameter, 10-12 cm long), with a dorsal one-way adjustable valve (V) which will intermittently allow suckled milk to flow out towards palate and tongue
4. Drain pipe (DP; about 5 mm diameter and 1.5 m length), emerging out from BBC to project out from right angle of the mouth

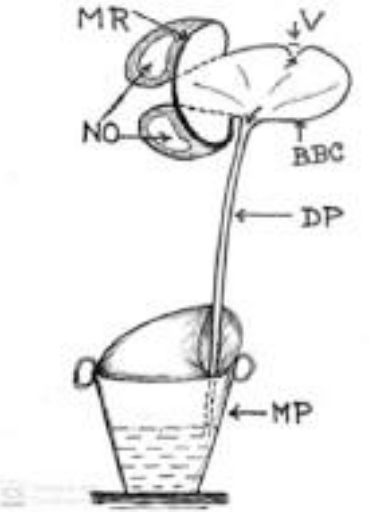


**Fig. - 7 : Disposable Muzzlo-buccal adapter cum Milk Harvester (MB Adapter)**

MR - Ring for fitting over Muzzle
V - One way valve towards palate
DP - Drain Pipe

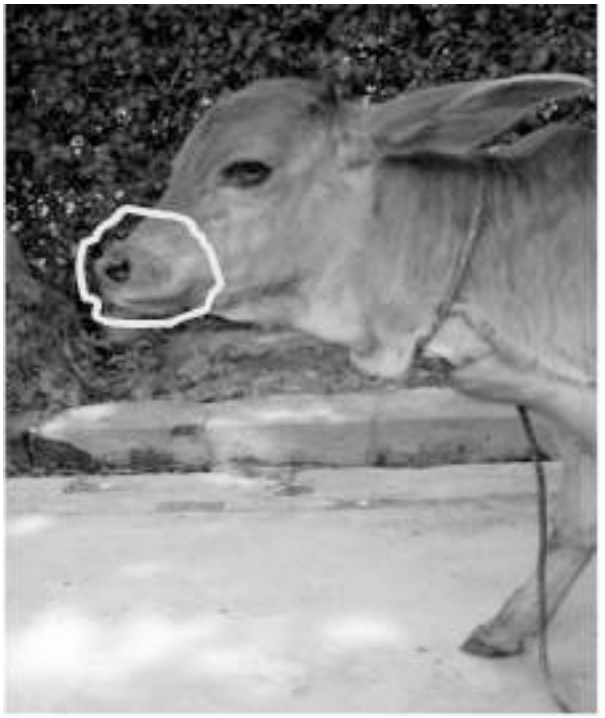

**Fig. - 8 : Muzzle of the Suckling Calf for MB Adapter**

NO – Openings for external nares
BBC- Ballooing part inside buccal cavity
MP - Milk Pail

On applying the disposable and sterilized MB adapter on to the calf's muzzle the MR and NO parts will get adjusted on the muzzle and nostrils, respectively, and would remain visible; whereas BBC will get engulfed by the calf to fit in to its buccal cavity. On making suckling attempts required quantity milk will intermittently flow out from one way valve towards palate and tongue, where from its taste will inspire the calf to continue suckling.

Remaining major amount of milk (>90%) present in BBC will flow down to the milk pail (MP) on ground under the influence of gravity, via a collapsible drain pipe (Fig. 7, 8). Harvest of milk could be considered complete if there is cessation of milk flow as visible through DP. At this time the MB adapter could be easily removed and may be disposed off as hand glove in case of artificial insemination of cow. The calf is expected to volunteer and easily adapt to the procedure with little training.

There seems no possibility that milk harvested by this technique will come in contact with any organ of buccal cavity or with secretions (saliva), and hence will remain free from any kind of contamination. Further, the same calf can be employed to harvest milk from other cows in succession. It is assumed that more than 10 cows could be easily milked by one calf twice daily. If so, the calf will also get sufficient share of milk, exercise and importance. This mechanism will provide value to the calves and they will not be neglected by their owners so easily.

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# MEDICINAL PROPERTIES OF TULSI (OCIMUM SANCTUM):A REVIEW

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**ABSTRACT**

**Tulsi a holyherb belongs toLamiaceae family. In Sanskrit it is known as Tulasi.It is grown in almost everyHindu household . It is of three type. First is known as Rama tulsi or shreetulsi (leaves are green in colour) The second is Shyamatulsior Krishna (colour of leaves are purple green) and the third is Vana or wild tulsi( leaves are dark green in colour). In Indian subcontinent the use of this medicinal plant has been taking place from more than 5000 years. Tulsi called as Holy basil in English. The description of this holy plant was also found in Padampuran as well as in Tulsikavacham. A variety of medicine can be prepared from different parts of tulsi.**

***Keywords*** *: Antimicrobial, phytochemicals, antidiabetic, metabolic, antistress etc.*

## INTRODUCTION

Throughout India, Tulsi is acclaimed as "The Queen of Herbs" and is revered as a sacred plant. Tulsi makes a delicious and nourishing herbal infusions ,abundant in a vast array of health benefits .Tulsi's life –enhancing qualities ,repeatedly noted in ancient Indian scriptures dating back over 5000 years.This aromatic plant ,is native to India.The different tulsi types exhibit vast diversity in morphology and phytochemical composition including secondary metabolites, yet they can be distinguished from other Ocimum species by the colour of their yellow pollen, high levels of eugenol1, and smaller chromosome number (2). Despite being distinct species with Ocimumtenuiflorum having six times less DNA than Ocimumgratissimum (2), they are traditionally used in the same way to treat similar ailments (3).

Tulsi has been the subject of numerous scientific studies and its pharmacological and wide range of therapeutic applications are the subject of more than one hundred publications during the last decade alone. Numerous in vitro and animal studies attest to tulsi leaf having potent pharmacological actions that include adaptogenic (4-6), metabolic(7-9), immunomodulatory(10-12), anticancer (13-15), anti-inflammatory (16-17), antioxidant (18-19), hepatoprotective (20-21), radioprotective (22-23), antimicrobial (24-27), and antidiabetic effects (28-30)that have been extensively reviewed previously (31-37).

Preclinical studies have demonstrated that tulsi increases swimming survival times in mice and prevents stress-induced ulcers in rats with antistress effects comparable to antidepressant drugs .Similarly, recent studies report leaf extracts from ethanolic and aqueous tulsi protects rats from stress-induced cardiovascular change. Studies in animal models have further shown that the leaf extract of tulsi possesses anticonvulsant and anxiolytic

activities. Several animal studies conducted over the past fifty years report that ingestion of tulsi leaves improves both glucose and lipid profiles in normal and diabetic-induced animal models. Tulsi aqueous leaf extract intramammary infusion has also showed promising effect on improving the immune response in bovine models.

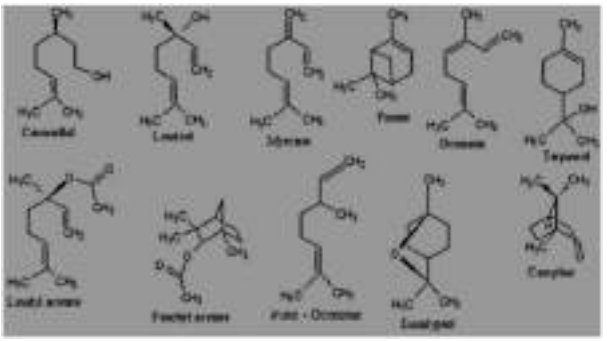
In addition to the extensive literature documenting in vitro and animal research, studies on the use of tulsi as part of a polyherbal formulation in humans has been systematically reviewed. To date, however, there are no systematic reviews on the clinical efficacy and safety of tulsi as a single herbal intervention in humans. The objective of this review was therefore to summarize and critically appraise human clinical trials of tulsi in order to assess the current evidence on tulsi's clinical efficacy and safety.

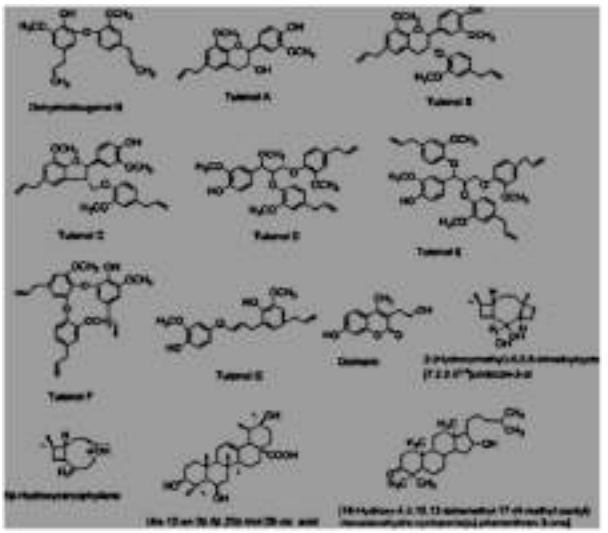
**Active Phytochemicals of Tulsi :-**

Eugenol is identified as one of the major active constituent and is reported to possess myriad benefits. Tulsi is also reported to possess caryophyllene, eugenol methyl ester, terpinene-4-ol, (+)-δ-cadinene, 3-carene, alpha-humulene, citral, (−)-trans-caryophyllene, eugenal, 6-allyl-3′,8-dimethoxyflavan-3,′-diol, 6-allyl-3-(4-allyl-2-methoxy phenoxy)-3′,8-dimethoxyflavan-′-ol, 5-allyl-3-(4-allyl-methoxyphenoxymethyl)-2-(4-hydroxy-3-methoxyphenyl)-7-methoxy-2,3-dihydrobenzofuran, 1,2-bis (4-allyl-2-methoxy phenoxy)-3-(4-hydroxy-3-methoxyphenyl)-3-methoxypropane, 1-(4-hydroxy-3-methoxyphenyl)-1, 2, 3-tris (4-allyl-2-methoxyphenoxy) propane, 1-allyl-4-(5-allyl-2-hydroxy-3-ethoxyphenoxy)-3-(4-allyl-2-methoxyphenoxy)-5-methoxybenzene, 3-(5-allyl-2-hydroxy-3-methoxyphenyl)-1-(4-hydroxy-3-methoxyphenoxy)-prop-1-ene, α-pinene, β- pinene, α-camphor, carvacrol, luteolin, limatrol, methylchavicol, caryophylline, cirsilineol, decyladehyde, cirsimaritin, isothymusin, isothymonin, apigenin, rosmarinic acid and cervacrol. Other phytoconstituents isolated from various parts of the plant include palmitric acid, vallinin, galic acid, Vitamin A, Vitamin C, ursolic acid and carvacrol (38).

**Structures of Phytochemicals of Tulsi :-**

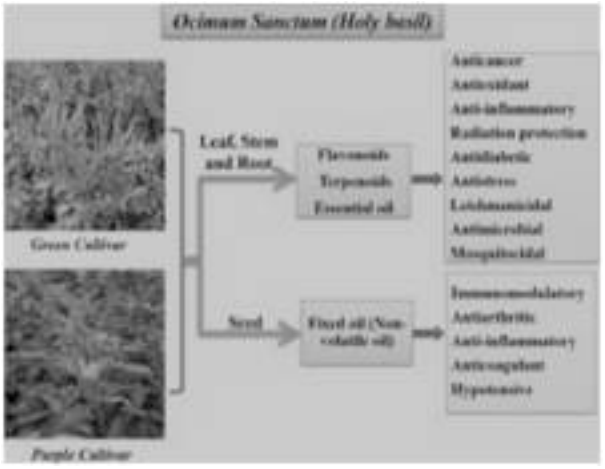
The phytochemical structures given below are present in different species of tulsi.

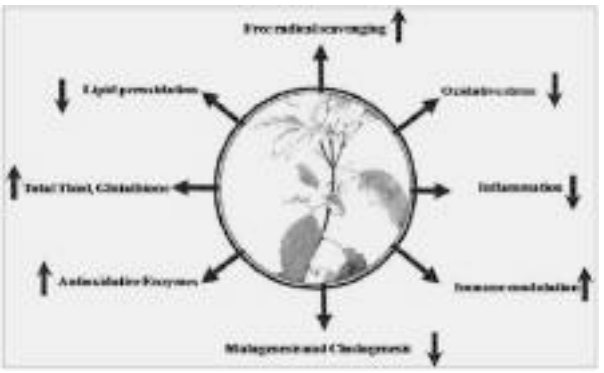




**Action of Phytochemicals of Tulsi :-**

The two figures given below are presentation of activity of phytochemicals of basil plant.



**Pharmacological Uses of Tulsi :-**

In the ancient Ayurvedic text, the CharakaSamhita, Tulsi has been documented to be of immense use in the treatment of headaches, rhinitis, stomach disorders, inflammation, heart diseases, various forms of poisoning and malaria. Each part of the plant has proven to offer protection against various diseases; the aqueous and alcoholic extract from the leaves have various pharmacological activities such as anti-inflammatory, antipyretic, analgesic, antiasthmatic, antiemetic, antidiabetic, hepatoprotective, hypotensive, hypolipidemic, and antistress agents. Further, distillation of the leaves yields oil of the plant which is known to possess antibacterial, antioxidant, and anti-inflammatory properties and is used extensively in the pharmaceutical industry mainly for skin cream preparations (38).

**Antimicrobial Phytochemicals of Tulsi** :-

Tulsi has been found active against viruses , bacteria like candida albicans, staphylococcus aureus ,Escherichia coli .Singh et.al. have been found in their studies that higher content of linoleic acid of tulsi is effective against microbes.

**Antidiabetic Phytochemicals of Tulsi** :-

Oral administration of O. sanctum extract led to a marked lowering of blood sugar in normal, glucose-fed hyperglycemic and streptozotocin-induced diabetic rats. A randomized, placebo-controlled, cross over single blind human trial indicated a significant decrease in fasting and postprandial blood glucose levels by 17.6% and 7.3%, respectively. Urine glucose levels showed a similar trend. Further, OS has aldose reductase activity, which may help in reducing the complications of diabetes such as cataract, retinopathy, etc39 A study conducted on rats has suggested that constituents of O. sanctum leaf extracts have stimulatory effect on of insulin secretion.40 A combination of Tulsi and Neem extracts has shown to lower the sugar levels in humans.41

**Antifungal Phytochemicals of Tulsi** :-

Tulsi extract has been effective against filamentous fungi which include Aspergillus Niger, A. fumigatus, A. flavus, Rhizopusstolonifera and Penicilliumdigitatum. Other clinically important filamentous fungi such as Fusariumsolani, P. funiculosum, Rhizomucortauricus, and Trichodermareesi are also susceptible to Tulsi extract. This activity is due to the constituents such as methyl chavicol and linalool that are present in the extracts of Tulsi.42

Antifungal activity has been shown by Tulsi

in a study where the minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFC) of various extracts and fractions were tested against clinically isolated five different dermatophytic fungi which showed antifungal activity at a concentration of 200 µg/mL. The fungicidal activity is said to be due to the action of secondary metabolites which are present in Tulsi including alkaloids, glycosides, saponins, tannins, ascorbic acids eugenol and various other metabolites, as mentioned previously (43).

**CONCLUSION**

In Ayurvedic practices tulsi used for treatment of Asthma ,Colds, congestions,cough,flu ,sore throat ,high blood pressure and high cholesterol and many more.Holi basil contains vitamin C and many antioxidants,which protect the heart from harmful effects.In modern days use of Tulsi as medicine should be increases . More research is needed in this field to enhance the medicinal property of Basil plant.

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## APPLICATION FOR THE MEMBERSHIP OF SBSRD ALLAHABAD

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1. **Name (in capital)** .....
2. **Designation** .....
3. **Affiliation** .....
4. **Address**.....
   .....
5. **Date of Birth** .....
6. **Mobile/Phone Nos** .....
7. **Email ID** .....
8. **Website (if any)** .....
9. **Academic Field** .....
10. **Research Field** .....
11. **Experience** (in years) **a)** Research.....**b)** Teaching.....
12. **Honours/Awards** (Nos.) **a)** National.....**b)** International.....
13. **Fellowships** (Nos. only) **a)** National.....**b)** International.....
14. **Publications** (Nos. only)
    **(i)** Research Papers/Rev. Articles.....**(ii)** Books/Monographs.....
15. **Fee Details** .....

**Declaration:** I hereby declare that the Information furnished above is true to the best of my knowledge and belief and I am abiding by the rules of the Society of Biological Sciences and Rural Development, Allahabad.

**Date:**.....  **Signature:** .....

MEMBERSHIP OF SBSRD, ALLAHABAD

| Category | Indian |
|---|---|
| 1. Annual | Rs. 500/- |
| 2. Life | Rs. 4000/- |
| 3. Institutional | Rs. 10,000/ |

The payment should be made through Demand Draft/E

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*Note: Please attach your complete bio-data for future academic/scientific recognitions by the Society