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EFFECT OF BIOFERTILIZER AND ORGANIC MANURE ON VEGETATIVE GROWTH OF POTATO (SOLANUM TUBEROSUM L.) CV KUFRI BADSHAH

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ABSTRACT

Organic matter might have provided balanced nutrition and congenial microclimate to grow and yield with full potential.Hormonal influence of VC might have augmented tuber yield.Seed treatment with biofertilizer was at par with VC in respect to growth and yield. Seed treatment might have encouraged better stand establishment. Number of leaves per plant were significantly influenced by the treatments. Lowest Number of leaves (20.26) were recorded in control . Highest number of leaves were recorded (40.32)in T_4 (1/2 FYM 1/2 vermicompost) treatment.

Keywords *: Biofertilizer, organic manure, kufri badshah.*

INTRODUCTION

Potato crop is grown under short day conditions in subtropical Indo-Gangetic plains. Uttar Pradesh, West Bengal, Bihar and Gujarat are the leading potato producing states in India . In year 2015 the area and production of potato was 33.7 thousand hectars and 0.23 million tones respectively (Anonymous 2015) .Therefore, there is a need to increase and sustain the productivity of potato, which can be achieved by safeguarding the soil health and improving soil fertility (Swaminathan, 2004) of potato fields. As no single source is capable of supplying the required amount of plant nutrients, integrated use of all sources of plant nutrients is best to supply balanced nutrition to the crop .The integrated nutrient management (INM) systems envisage the use of organic manure along with chemical fertilizers.These sources can reduce the mining of soil nutrients and improve overall soil productivity in terms improved physico-chemical and biological conditions of soil. Higher food production needs higher amount of plant nutrients. Use of inorganic fertilizers has increased considerably to meet the higher nutrient requirements of the present day improved varieties. This creates imbalance in nutrients supply, leading to decline in soil fertility, crop productivity and sustainability. Use of organic matter to meet the

nutrients requirement of crops would be an inevitable practice in years to come. A number of diverse organic sources are available for the use in agriculture. Organic manures like farmyard manure, poultry manure and vermin-compost can play important role in potato productivity. The beneficial effects of organic manure are manifested through increase in soil organic matter, humus and over all soil productivity over the period. Soil organic matter and humus act in several ways, i.e., serves as slow release source of plant nutrients to the crops and increases water holding capacity to maintain the water regime of the soil and act as a buffer against change in soil PH. Biofertilizers like phosphorous solubilizing bacteria (PSB) or Azotobacter may be useful for improving phosphorous and nitrogen nutrition in potato. Also, the application of PSB would help in increasing the efficiency of available phosphorous in the soil by converting unavailable phosphorous into available form. Similarly, nitrogen fixing biofertilizers like azotobacter has the potential to meet a successful availability of nitrogen requirement of potato.

Keeping above points in view a trial on" *Effect of biofertilizer and organic manure on growth of potato (solanum tuberosum L.) cv Kufri Badshah* was conducted to study the effect of organic manure and biofertilizer .

MATERIALS AND METHODS

Field experiment entitled "**Effect of Biofertilizer and organic manure on growth and yield of potato (*Solanum tuberosum* L.) "** was conducted at the Horticulture Farm, Kulbhaskar Ashram post graduate college, Prayagraj, Utter Pradesh during winter season in 2018-19. The details of the procedure adopted for crop raising and criteria used for treatment evaluation during entire course of investigation are described a under

The experiment consists of 8 treatment co**mbinations comprising of organic manures** with and without biofertilizer (viz. NPK liquid consortia Bio). The details are as below.

Table - 1 : Details of treatments used in study

S.N.	Treatment symb.	Treatment details
1.	T_0	Control unit (Recommonded Doze of Fertilizers=RDF)
2.	T_1	FYM@15 t/ha
3.	T_2	Vermicompost @5 t/ha
4.	T_3	NPK Liquid consortium (Biofertilizer)@150ml/10kg seed treatment
5.	T_4	7.5 tonnes FYM+2.5 tonnes vermicompost /ha.
6.	T_5	7.5 tonnes FYM/ha +75ml NPK liquid consortium (Bio fertilizer) /10kg seed treatment.
7.	T_6	2.5 tonnes vermicompost/ha+75ml NPK Liquid consortium (Bio fertilizer)/10kg seed treatment.
8.	T_7	5 tonnes FYM/ha+1.66 tonnes vermicompost/ha+50ml NPK liquid consortium /10kg seed treatment.

EXPERIMENTAL DETAILS AND LAYOUT:

Design of experiments.

The experiment was laid out in Randomized Block Design with three replications.

The treatments were randomly allotted to different plots using random number table of Fisher and Yates (1963).

Table - 2 : Randomly Allotted to Different Plots Using Random Number

S. N.	**Design**	:	**Randomized Complete Block Design.**
1.	Replication	:	Three
2.	Treatment	:	Eight
3.	Total number of plots	: :	24
4.	Name of crop	:	Potato (*solanum tuberosum* L.)
5.	Variety	:	Kufri Badshah
6.	Plot size	:	2x1.8=3.6. cm. sq
7.	Row to Row distance	:	60.cm
8.	Plant to plant distance	:	20.cm
9.	Number of rows in each plot	:	3.
10.	Gross area of experimental field	:	18.7x9.2=172.04 sq. m.
11.	Net area of experimental field	:	16x5.4=86.4sq.m.
12.	Number of plants for observation per plot	:	5.
13.	Plot to plot distance	:	30.cm.
14.	Distance between replication	:	1.0m.
15.	Season	:	Winter 2018-19
16.	Date of sowing	:	18-11-2018
17.	Date of harvesting	:	18-03-2019

RESULTS AND DISCUSSION

The results of the field experiment were carried out to study the Effect of biofertilizer and organic manure on growth and yield of potato(*Solanum* tuberosum L.) conducted at Horticulture Farm, Kulbhaskar Ashram Post Graduate College, Pryagraj. Utter Pradesh are presented here-

The finding of the investigation entitled Effect of biofertilizer and organic manure on growth and yield of potato (*Solanum tuberosum* L.)" has been described and explained with support of relevant research work published by earlier workers in the subject as follows.

The use of organic manure in soil not only increase the fertility and moisture holding capacity in soil ,but also play an important role in soil water conservation by their binding and aggregation properties .More over they are helpful in balancing nutrient availability to growing plants and boost the production and quality of crops.

Health problems, quality consciousness and

degradation of natural resources in the environment have thrown new challenge .Due to these burning problems organic farming and use of biofertilizer is gaining lot of importance towards achieving sustainability in crop production.

Several attempts have been made in part to increase the yield potential of tuber crops but they are concerned with use of chemical fertilizers.

Unfortunately not only the productivity potential is low but the quality is also deteriorating. Hence it is time to think not only of increasing the production but also to improve the quality. In any crop production program, the main factor to be considered for better returns is lower the cost of production without compromising on yield of the crop . The results obtained are discussed have under.

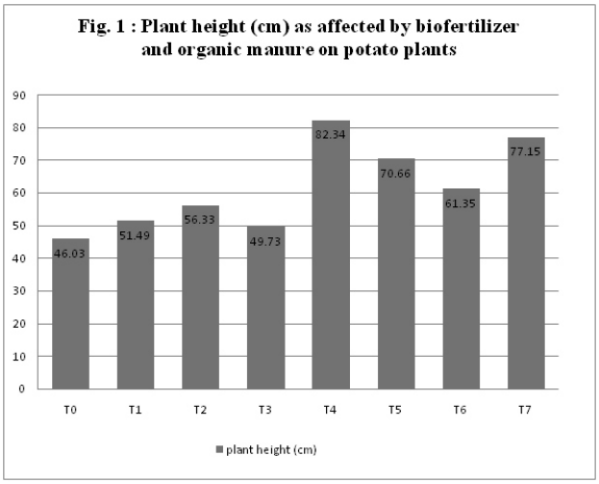
. GROWTH PARAMETERS:

Plant height (cm):-

Data clearly shows that the plant height was significantly influenced by the treatments. Lowest plant height (46.03cm) was recorded in control .While the highest plant height was recorded (82.34cm)in T_4 (1/2FYM ½ vermicompost) treatment .All the treatments were better over control. Single application of vermicompost was better over FYM. Second treatment was not as good as FYM and vermicompost treatment. FYM and vermicompost when applied togather reducing the half dose, the height was increased .Reduction of FYM &vermicompost to the 1/3rd level reduced the plant height (77.55cm). Organic matter was beneficial to increase the height of the potato plant. Organic matter was found to increase microflora level of the soil which increase the mineralization of nutrients. These nutrients become easily available to the plant. Findings are in conformity with the findings of ***Padamawar and Dakore (2010)*** in Cole crops ,***Narayan et al. (2013)***in potato and ***Verma et al. (2011)*** in potato.

Table - 3 : Effect of biofertilizer and organic manures on plant height in potato :-

Treatment symbol	Treatment Details	Plant height (cm)
T_0	Control Unit (Recommended Dose of Fertilizer =RDF)	46.03
T_1	FYM@ 15t/ha	51.49
T_2	Vermicompost @5t/ha	56.33
T_3	NPK liquid consortium (Biofertilizer) @150ml per10kg seed treatment	49.73
T_4	7.5 tones FYM+2.5tones vermicompost /ha	82.34
T_5	7.5tones FYM/ha+75ml NPK liquid consortium (Biofertilizer) /10kg seed treatment	70.66
T_6	2.5tonnes vermicompost /ha+75ml NPK liquid consortium (Biofertilizer)/10kg seed treatment	61.35
T_7	5 tonnes FYM/ha+1.66 tonnes vermicompost/ha+50ml NPK liquid consortium/10kg seed treatment	77.15
	SEm±	**2.32**
	C. D. at 5% level	**5.11**



Number of primary branches per plant on main stem :-

Data clearly shows that number of primary branches per plant on main stem weresignificantly influenced by the treatments. Lowest Number of primary branches (3.64) were recorded in control .While the highest number of primary branches were recorded (14.20)in T_4 (1/2FYM 1/2vermicompost) treatment . All the treatments were better over control. Single application of vermicompost was better over FYM.Second treatment was not as good as FYM and vermicompost treatment.FYM and vermicompost when applied togather reducing upto half dose, the number of primary branches were increased.Reduction of FYM &vermicompost to the 1/3rd level reduced the primary branches (13.11). Organic matter was beneficial to increase the primary branches of the potato plant. Organic matter was found to increase microflora level of the soil which increases the mineralization of nutrients. These nutrients become easily available to the plant. Hormonal level and polarity of the hormones might have influenced the branching pattern of potato plant. Findings are conformity with the findings of**Singh (2010).** He reported that the application of inorganic 15%+Azospirillium +FYM 5t/ha recorded the best yield attributes like more number of leaves, more yield and more cost –benefit ratio (1:5.27) as compared to control in turmeric .**Vivek *et al.* (2001)**also reported similar result in potato.

Table - 4 : Effect of bioferilizer and organic manure on number of primary branches on main stem per plant in potato :-

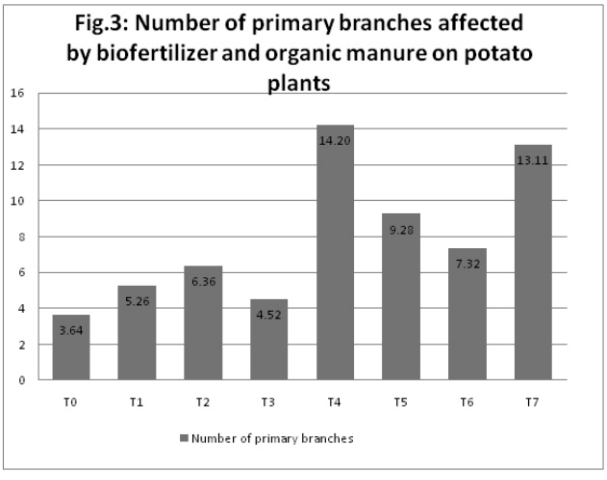
Treatment symbol	Treatment Details	Primary branches on main stem per plant
T_0	Control Unit (Recommended Dose of Fertilizer =RDF)	3.64
T_1	FYM@ 15t/ha	5.26
T_2	Vermicompost @5t/ha	6.36
T_3	NPK liquid consortium (Biofertilizer) @150ml/ 10kg seed treatment	4.52
T_4	7.5 tonnes FYM+2.5tonnes vermicompost /ha	14.20
T_5	7.5tonnes FYM/ha+75ml NPK liquid consortium (Biofertilizer) /10kg seed treatment.	9.28
T_6	2.5tonnes vermicompost /ha+75ml NPK liquid consortium (Biofertilizer)/10kg seed treatment	7.32
T_7	5 tonnes FYM/ha+1.66 tonnes vermicompost/ha+50ml NPK liquid consortium/10kg seed treatment	13.11
	SEm±	**1.31**
	C. D. at 5% level	**2.43**

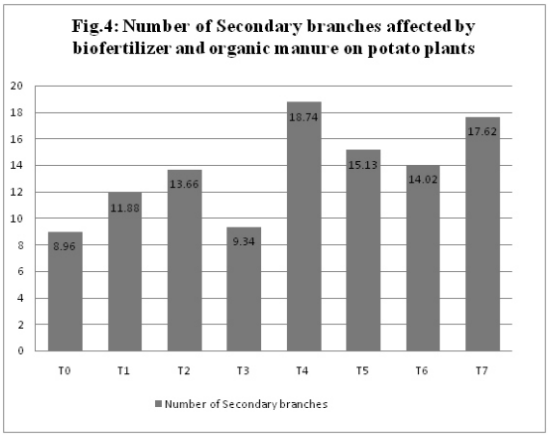
4.1.3: Number of secondary branches per plant:-

Clearly shows that number of secondary branches per plant on main stem was significantly influenced by the treatments. Lowest Number of secondary branches (8.96) were recorded in control .While the highest secondary branches were recorded (18.74)in T_4 (1/2FYM ½ vermicompost) treatment. All the treatments were better over control. Single application of vermicompost was better over FYM.Second treatment was not as good as FYM and vermicompost treatment. FYM and vermicompost when applied togather reducing upto half dose, the number of secondary branches were increased .Reduction of FYM &vermicompost to the $1/3^{rd}$ level reduced the number secondary branches (17.62). Organic matter was beneficial to increase the number of secondary branches of the potato plant. Organic matter was found to increase microflora level of the soil which increases the mineralization of nutrients. These nutrients become easily available to the plant. Sturdy root system and more number of primary branches might have influenced the higher number of secondary branches per plant. Findings are inconformity with the findings of ***Kore et al***. **(2006) .** Hereported that plant height and number of leaves per plant in garlic were maximum in plant receiving combined nutrients dose @ 10tFYM+3kg azotobacter+3kg PSP +75 percent RDF per ha. ***Hussin et al.(2007***)reported that chicken manure and compost+biofertilizer increased stem per hill in potato crop.***Meena et al. (2014***)in tomato crops also found similar results. ***Kumar et al.(2005)***reported that the micronutrient can be supplied through various organic manures for correcting the deficiencies thus favoring proper growth and development . ***Ghose et al.(1998***) repoted that organic farming has potential for reducing some of the negative impact of conventional agriculture to the environment and an option to restore the productivity degraded soil.

Table - 5 : Effect of biofertilizer and organic manure on number of secondary branches per plant in potato :-

Treatment symbol	Treatment Details	Secondary branches on main stem per plant
T_0	Control Unit (Recommended Dose of Fertilizer =RDF)	8.96
T_1	FYM@ 15t/ha	11.88
T_2	Vermicompost @5t/ha	13.66
T_3	NPK liquid consortium (Biofertilizer) @150ml/ 10kg seed treatment	9.34
T_4	7.5 tonnes FYM+2.5tonnes vermicompost /ha	18.74
T_5	7.5tonnes FYM/ha+75ml NPK liquid consortium (Biofertilizer) /10kg seed treatment .	15.13
T_6	2.5tonnes vermicompost /ha+75ml NPK liquid consortium (Biofertilizer)/10kg seed treatment	14.02
T_7	5 tonnes FYM/ha+1.66 tonnes vermicompost/ha+50ml NPK liquid consortium/10kg seed treatment	17.62
	SEm±	**1.41**
	C. D. at 5% level	**2.31**





Number of leaves per plant :

Number of leaves per plant were significantly influenced by the treatments. Lowest Number of leaves (20.26) were recorded in control . Highest number of leaves were recorded (40.32)in T_4 (1/2 FYM 1/2 vermicompost) treatment .All the treatments were better over control. Single application of vermicompost was better over FYM.Second treatment was not as good as FYM and vermicompost treatment. FYM and vermicompost when applied togather reducing up to half dose, the number of leaves were increased .Reduction of FYM &vermicompost to the 1/3rd level reduced the number of leaves (38.02). Organic matter was beneficial to increase the number of leaves of the potato plant . Organic matter was found to increase microflora level of the soil which increases the mineralization of nutrients.Number of primary and secondary branches were directly proportional to the number of leaves per plant.Results are conformity with the results of ***Raghav and Kamal (2009).*** They reported that the vegetative growth of plants in terms of numberof haulms were maximum in treatments having combination of farm yard manure, poultry manure along with vermicompost . Positive effect of the combined application of inorganic and biofertilizer were also reported by ***Vivek et al. (2001)*** in potato. ***Kouchi (2006***) reported that Bio - fertilizers are consisted one of several useful micro organism that are capable of changing soil nutrition element to other mineral which are carried to that root of the plant .

Table 6 :- Effect of biofertilizer and organic manure on number of leaves per plant in potato :

Treatment Symbol	Treatment Details	Number of leaves per plant
T_0	Control Unit(Recommended Dose of Fertilizer =RDF)	20.26
T_1	FYM@ 15t/ha	26.36
T_2	Vermicompost @5t/ha	30.22
T_3	NPK liquid consortium (Biofertilizer) @150ml/ 10kg seed treatment	22.11
T_4	7.5 tonnes FYM+2.5tonnes vermicompost /ha	40.32
T_5	7.5tonnes FYM/ha+75ml NPK liquid consortium (Biofertilizer) /10kg seed treatment .	34.15
T_6	2.5tonnes vermicompost /ha+75ml NPK liquid consortium (Biofertilizer)10kg seed treatment	32.25
T_7	5 tonnes FYM/ha+1.66 tonnes vermicompost/ha+50ml NPK liquid consortium/10kg seed treatment	38.02
	SEm±	**2.13**
	C. D. at 5% level	**4.12**

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COMPARATIVE EFFICACY BETWEEN DIFFERENTT RICHODERMA SPP. AGAINST VACULAR WILT CAUSING PATHOGENS F. OXYSPORUM F. SP. CICERIS INFECTING CHICKPEA

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ABSTRACT

In present investigation the four isolates of *Trichoderma* spp viz. *T.harzianum,T.viride*,JB-6914 andJB-6888 were used against vacular wilt causing pathogens *F. oxysporum f. sp. ciceris*. Maximum percentage of inhibition (50.11%) was recorded with *T.harzianum*followed by *T.viride*(44.97%) and JB-6914 (38.75%) whereas the isolate JB-6888 (12.72%) was recorded with least effective in paresitization of mycelia growth of pathogen as tabulated in Table and Fig. It may be due to variable toxicity produced by all the selected *Trichoderma* spp. attributed towards combating the pathogen *F. oxyxporum* f. sp. *ciceris*. In dual culture, particularly at the site of interaction zone, *Trichoderma* spp. having multifarious action against pathogen in which they would suppress to the disease-causing microbe by coiling and mycoparasite nature, releasing high toxin in substrate where both are having sprace for growth.

Keywords *: Efficacy, vascular wilt, pathogen.*

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the world's third most important pulse crop, after dry beans (*Phaseolus vulgaris* L.) and dry peas (*Pisum sativum* L.) – (Vishwadhar and Gurha, 1998). Chickpea (*Cicer arietinum* L.) is a vital source of plantderived edible protein in many countries. Chickpea also has advantages in the management of soil fertility, particularly in dry lands and the semiarid tropics. Indian subcontinent accounts for 90% of the total world chickpea production (Juan et al., 2000). *Fusarium oxysporum* f. sp. *ciceris* is a wilt fungus causing severe damage wherever this crop is grown (Rangaswami et al., 1999). It is more prevalent in lower latitudes (0-30ºN) where growing season is relatively dryer and warmer than in the higher latitudes (30-40ºN). *Fusarium* wilt is one of the major diseases of chickpea and at national level the yield losses encountered was reported to the tune of 60 per cent (Singh et al., 2007).The pathogen is a common soil inhabitant with taxonomic nomenclature *Fusarium oxysporum* f. sp. *ciceris* (Padwick) Matuo and Sato (Snyder and Hansen, 1940).Saxena and Singh (1987) reported that

*Fusarium oxysporum*f. sp. *ciceris* is septate, profusely branched growing on potato sucrose/dextrose agar at 25^0C initially white turning light buff or deep brown later, fluffy or submerged. The growth becomes felted or wrinkled in old cultures. Various types of pigmentation (yellow, brown, crimson) can be observed in culture. Couteaudier and Alabouvette (1990) reported that the macroconidia are straight to slightly curved, slender, thin walled usually with three or four septa, a foot-shaped basal cell and curved apical cell. They are generally produced from phialides on conidiophores by basipetal division. The microconidia are ellipsoidal and either have no septum or a single one. Both are formed from phialides in false heads by basipetal division. They are important in secondary infection. The chlamydospores are globose and have thick walls. They are formed from hyphae or alternatively by the modification of hyphal cells. They are important as endurance organs in soils where they act as inocula in primary infection.The teleomorph or sexual reproductive stage, of *Fusarium oxysporum*f. sp. *ciceris*is unknown (Leslie and Summerell, 2006). Fisher *et al*. (1982) reported that highly virulent strain of *Fusarium oxysporum* f. sp. *ciceris* was isolated from infected chickpea plant by using Komada's medium (Komada, 1975) and confirmation of Fusarium was made on carnation leaf agar medium. Honnareddy and Dubey (2007) reported that the isolates of *Fusarium oxysporum* f. sp. *ciceris* had variable pigmentation which varied from normal white to violet, brown, reddish violet, greenish violet, yellowish pink and dark green. Barnet and Hunter (1972) purified *Fusarium oxysporum* f. sp. *ciceris* by single spore isolation method and maintained on PDA slants throughout the investigation by periodical transfer. Sumitra (2006) reported that *Fusarium oxysporum* f. sp. *ciceris* was sub cultured on PDA slants and allowed to grow at 27 ± 1ºC for ten days and such slants were preserved in a refrigerator at 5ºC and revived once in 30 days. Pure culture of *Fusarium oxysporum*f. sp. *ciceris* was prepared on Czapekdox agar medium and it was multiplied on Waksman's agar medium (Glucose 10 g, Peptone 5 g, Potassium dihydrogen phosphate 1 g, Magnesium sulphate 0.5 g, Distilled water 1000 ml) (Muhammad Ansar Ahmad, 2010). Fusarium species were maintained on PDA slants and were stored at 4°C till use (Hend et al., 2012).Rini and Sulochana (2007) tested *Trichoderma* isolates and *Pseudomonas fluorescens* isolates against *Fusarium oxysporum* diseases in tomato and revealed that the combined application of both *Trichoderma* and *Pseudomonas* isolates has given highest disease suppression. *Trichoderma spp*. interacts with plant pathogens in a variety of ways. The initial detectable interaction shows that the hyphae of the mycoparasite grow directly towards the host by a chemotrophic reaction (Chet and Baker., 1981). When the mycoparasite reaches the host, its hyphae coils around it and penetrates into the host mycelium by partial degradation of its cell wall (Elad*et al*., 1983). It appears that the main mechanism involved in the antagonism to pathogenic fungi by *Trichoderma spp*. is the release of lytic enzymes. The production of extracellular β-1, 3 glucanases, chitinases (Elad*et al*., 1982) and protinase (Geremia*et al*., 1993) increased significantly when *Trichoderma* is grown in the medium supplemented with either autoclaved mycelium or fungal cell walls. These enzymes play an important role in the destruction of the pathogens (Chet and Baker, 1981; Hadar*et al*., 1979). The lytic activity of several strains of *Trichoderma spp.* on cell walls of phytopathogenic fungi was correlated with the degree of biological control of these pathogens in vitro (papavizas, 1985).

Bhale*et al*., (2013) observed antagonistic potentials of five *Trichoderma* species against fruit rots pathogens of sapodilla under laboratory conditions and they revealed that, the percent inhibition of *T. koningii* (57.70%) and *T. harzianum* (54.40%) proved to be more than 50% antagonistic over control. Geeta and Bhadraiah, (2012) studied antagonist activity of nine *Trichoderma* species against three pathogenic fungi i.e., *Colletotrichum capsici*, *R. solani* and *F. oxysporum* in dual culture plate technique. Amoung the nine isolates *T. reeseii* (T7) &*T. pseudokonigii* (T6) showing potential antagonistic and inhibited the *Colletotrichum capsici, R. solani* and *F. oxysporum* mycelia growth. Pandey and Upadhyay, (2000) isolated eleven fungi and four bacterial isolates from the rhizosphere of disease pigeonpea plants and screened for their antagonism to *F. udum*using the dual culture technique. Among all, isolates of *T. harzianum, Gliocladiumvirens* and *T. viride* exhibited strong antagonism by inhibiting hyphal growth of *F. udum. T. viride* formed loops and coiled around the pathogen hyphae, and after 9days incubation, lysis of the parasitized hyphae, rupturing of the cell wall and leakage of cytoplasm of the pathogen were observed. *G. virens* caused twisting, air bubbling and disintegration of the pathogen hyphae while *T. harzianum* caused severe vacuolation, shrinkage and coagulation of the cytoplasm of the pathogen hypha.

MATERIALS AND METHODS

Survey:

An extensive field survey was conducted during September to October in the cropping season of 2015-2016 in chickpea growing areas of Bundelkhand region (Orchha, Baruasagar, Mahoba) U.P for the isolation of wilt causing pathogen *Fusariumoxysporum*f. sp. *ciceris* from infected chickpea. A systematic survey was conducted to obtain a reliable estimate of *Fusarium oxysporum* presence, effected portions of chick pea showing characteristic symptoms of Dieback disease were brought in the laboratory of department of Botany, Bundelkhand University, Jhansi for detection and isolation of the pathogen responsible for the disease.

The details of materials used and the methodology followed in conducting the experiments are described as under: -

Glassware Cleaning: -

Borosilglassware's were used for all the laboratory experiment studies. They are kept for a day in the cleaning solution containing 60 ml of concentrated sulphuric acid, in 1 litre of water. Then they were cleaned by washing with detergent solution followed by several times in tap water and finally with distilled water.

Sterilization: -

All the glassware's used in the studies were sterilized in autoclave at 15 psi for 30 minutes and kept in hot air oven at 175 for one hour.

Preparation of media : -

Potato dextrose agar medium:

Potato (peeled) : 200 gm

Dextrose : 20 gm

Agar : 20 gm

Distilled water: 1000 ml

500 ml of water was in one litre capacity beaker and 200 gm washed; peeled and sliced potatoes were added to the beaker. Potatoes were boiled gently for 30 minutes of by the time till they are easily penetrated by a glass rod. Boiled potatoes were filtered through muslin cloth and squeezed out all the liquid.

In another beaker, 500 ml of water was taken and heated; to which 20 gm agar was added bit to get it dissolved, followed by addition of 20 gm of dextrose. Potato extract was mixed with agar and dextrose and water was added to make volume up to

1000 ml. the whole mixture was stirred gently to allow the proper dissolution of agar and dextrose.

The PDA medium was poured into five conical flask each of 200 ml capacity. The flask was plugged with cotton and wrapped with aluminium foil. Conical flask with medium were sterilized at 121ºc at 15 psi pressure in an autoclave for about 30 minutes. After autoclave the flask could be hold by hand. The media was then poured into the already sterilized Petri plates under aseptic conditions in laminar air flow and then allowed to solidify.

Screening of biocontrol fungi against the wilt fungus:

***In-vitro* testes:**

Sources of bio-control agents and pathogen *Fusarium oxysporum* f. *sp. ciceris:*

Four isolates of *Tricchodermaspp .T.harzianum, T.viride, JB-6914, JB-6888* and test fungi (*Fusarium oxysporum* f. *sp. ciceris)* were selected for the present study; each of selected genera was procured form Indian Type Culture Collection, Division of Plant Pathology, Indian Agricultural Research Institute, New Delhi.

Collection and maintenance of *Trichoderma species:*

The purified and identified cultures of *Trichoderma species and Fusarium oxysporum*were maintained on PDA by sub-culturing at regular interval to obtain pure culture and the pure culture were stored at 4ºc for maintaining their virulence and further use.

In-vitro* evaluation of *Trichoderma* species isolates against *F.oxysporum* f. *sp. ciceris:

Four isolates of *Trichoderma species* viz. *T.harzianum, T.viride, JB-6914 and JB-6888* were taken in the present study to evaluate their potentiality against vascular wilt causing fungus *F.oxysporum* f. *sp. Ciceris*on chickpea.

Dual Culture Technique:

The potential of four isolate of *Trichoderma* species were evaluated against *F. oxysporum* f. sp. *ciceris* the vascular wilt causing pathogen by dual culture technique as described by Morton and Stroube (1955).The inoculation was done with 5 mm diameter mycelia disc of 5 days old culture of pathogen *F. oxysporum*f spp. *ciceris* with *T.harzianum, T.viride, JB-6914* and *JB-6888* on separate PDA contained in petriplates with 90 mm diameters at equal distance from the petriplate. Adequate control was also maintained with three replications for each treatment. Inoculated plates were then incubated at 25± 2^{0}C in B.O.D. incubator in which the radial growth of *F.oxysporum* were measured at intervals of 3, 6 and 9 days after incubation. Percent inhibition of radial growth of *F.oxysporum* was calculated by using the prescribed formula.

$$I = \frac{C-T}{C} \times 100$$

I = Percent growth inhibition

C = Colony diameter of pathogen in control

T = Colony diameter/radial growth of pathogen in treatment

From the zone of inhibiting the antagonist, *Trichoderma spp.*and the test pathogen *F. oxysporum* f. *sp. Ciceris*in dual culture plate, the mycelia mats gently lifted with a needle and kept on a microscopic slide with a drop of cotton blue strain, the mycelium bit was gently spread with a needle and examined under microscope for hyphal interaction.

Statistical analysis and presentation of Data:

The data from field observations were analyzed by using Randomized Block Design described by M-STAT software (1978). The data on various parameters were subjected to statistical

analysis by adopting appropriate method of analysis of variance as described by Fisher (1958). Thedata pertaining to weed population recorded at 20, 40, 60 DAS and harvest were subjected to Log (X+1) and $\sqrt{x + 0.5}$ transformations as per requirement for statistical analysis. Wherever, variance ratio (calculated 'F' values) was found significant, critical difference (C.D.) values were computed by following formula for making comparisons between the treatments:

$$C.D. = \sqrt{\frac{V}{r}} \times \sqrt{2} \times t$$

where,

r : The number of replication,

V_e : mean sum of squares (MSE) and

t : tabulated value of 't' at 5% level of significance

The data have been presented in the form of summary tables with mean values of the characters and the C.D. at 5% level of probability. Suitable graphical illustrations of the data have also been given at appropriate places in the text. The analysis of variance tables has been given in appendices.
The skeleton of analysis is given in Table 1.0

Table - 1.0 : Skeleton of ANOVA for the design of the experiment

S.N.	Source of Variation	D.F.	SS	MSS	F_{Cal}	F_{Tab}
1.	Replication	2				
2.	Treatment	13				
3.	Errors	26		V_e		
	Total	**41**				

RESULTS AND DISCUSSIONS

In the present study, four isolates of *Trichoderma* were evaluated against *Fusarium oxysporum* f sp. *Ciceris* by dual culture method as per procedure described in materials and methods. All of the *Trichoderma* strains had a significant inhibitory effect on the mycelia growth of the pathogen as compared to untreated control. The results revealed that all isolates of *Trichoderma* spp. significantly inhibited the mycelia growth of plant pathogen (*Fusarium).* Maximum growth inhibition of pathogen observed with *T.harzianum* isolate. A clear zone of inhibition was formed in all *Trichoderma* pathogens interactions. Differential action of the biocontrol agents was noticed on mycelia growth of the *Fusarium oxysporum* f spp. *Ciceris*(figure). Among the four isolates of *Trichoderma* spp., maximum percentage of inhibition (50.11%) was recorded with *T.harzianum* followed by *T.viride*(44.97%) and JB-6914 (38.75%) whereas the isolate JB-6888 (12.72%) was recorded with least effective in parasitisation of mycelia growth of pathogen as tabulated in Table 1.1 and figure1(a), 1(b) and 1(c). It may be due to variable toxicity produced by all the selected *Trichoderma* spp. attributed towards combating the pathogen *F. oxyxporum* f. sp. *ciceris*. In dual culture, particularly at the site of interaction zone, *Trichoderma* spp. having multifarious action against pathogen in which they would suppress to the disease-causing microbe by coiling and mycoparasite nature, releasing high toxin in substrate where both are having sprace for growth. In addition to above nature of *Trichoderma* spp., it is also having antibiosis and lysis nature in presence of antibiotics and enzymes (Chitinases, and glucanases) respectively. In support of present findings of dual culture test, a handsome amount of work is available as review of literature, out of which, Chet and Baker, (1981) studied very extensively on *Trichoderma spp*. interacts with plant pathogens in a variety of ways. The initial detectable

interaction shows that the hyphae of the mycoparasite grow directly towards the host by a chemotrophic reaction. When the mycoparasite reaches the host, its hyphae coils around it and penetrates into the host mycelium by partial degradation of its cell wall (Elad*et al*., 1983). It appears that the main mechanism involved in the antagonism to pathogenic fungi by *Trichoderma spp*. is the release of lytic enzymes. The production of extracellular β-1, 3 glucanases, chitinases (Elad*et al*., 1982 & 1984) and protinase (Geremia*et al*., 1993) increased significantly when *Trichoderma* is grown in the medium supplemented with either autoclaved mycelium or fungal cell walls. These enzymes play an important role in the destruction of the pathogens (Hadar*et al*., 1979). Similarly, Papavizas, (1985), a pioneer worker on Trichoderma spp., also poses another characteristic fiture as the lytic activity of several strains of *Trichoderma spp.* on cell walls of phytopathogenic fungi was correlated with the degree of biological control of these pathogens *in vitro*.

Table - 1.1 : Effect of antagonistic fungi on radial growth inhibition of *Fusarium oxysporum*in dual culture test.

Treatment of fungal bio-control agent		Radial growth inhibition (%) of *Fusarium oxysporum f. spciceris*			Mean
		3 Days	6 Days	9 Days	
T-1	*T.harzianum*	31.98 (22.94)	37.28 (36.06)	50.11 (44.95)	39.79 (34.65)
T-2	*T.viride*	18.64 (23.28)	40.85 (39.73)	44.97 (42.06)	34.82 (35.02)
T-3	*JB-6888*	25.02 (29.94)	17.91 (17.91)	12.72 (16.74)	18.55 (21.53)
T-4	*JB-6914*	7.06 (14.64)	37.61 (37.61)	38.75 (38.42)	27.80 (30.22)
S.Em±		1.41	7.03	5.99	
CD@5%		13.64	22.15	18.87	

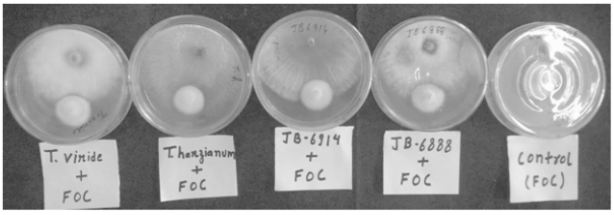


Plate 1(a): Antagonistic potential of *Trichoderma* spp. against *F. oxysporum* f. spp. *ciceris* (after 3 day).

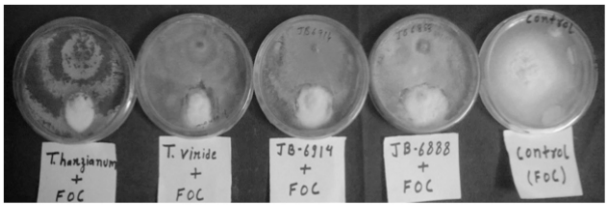


Plate 1(b): Antagonistic potential of *Trichoderma* spp. against *Fusarium oxysporum* f. spp. *ciceris* (after 6 day).

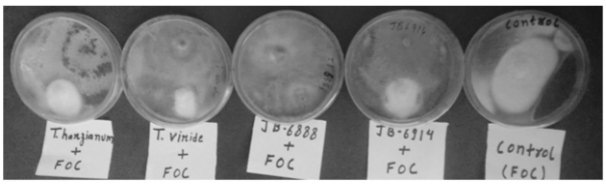
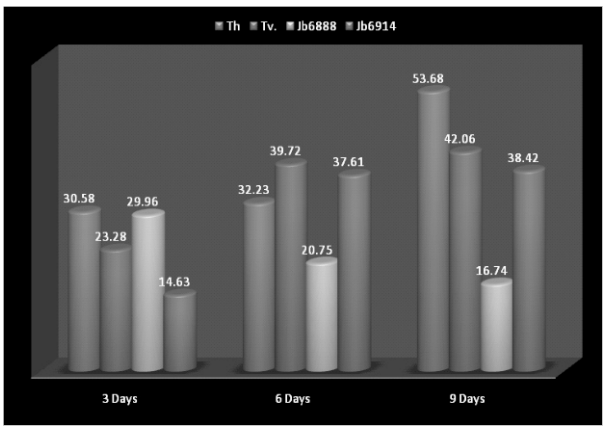


Plate 1(c): Antagonistic potential of *Trichoderma* spp. against *Fusarium oxysporum* f. spp. *ciceris* (after 9 day).



Effect if antagonistic fungi on radial growth inhibition of *Fusarium oxysporum*f. sp. *cicerisi*n dual culture test.

CONCLUSION

The nature of competition, *Trichoderma* is

favoured and multiplied on dead mycelium of kind of hostpathogen including *F. oxysporum f. sp. ciceri.* The present study has demonstrated that the integration of*T. harzianum, T. viride*, and theisolateJB-6914, JB-6888can be used for not only the managing wilt disease and disease complexes of chickpea also would be essential ingredients for sustainable quality organic farming.

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HIGH FREQUENCY INDUCTION OF SOMATIC EMBRYOGENESIS AND PLANT REGENERATION FROM SEEDLING EXPLANTS OF BLACK GRAM (L) HEPPER

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ABSTRACT

Black Gram (*Vigna mungo*) is a tropical, edible and leguminous plant belongs to the sub genus *Ceratotropis* of the genus *Vigna*. Black gram is considered to have been domesticated in India from its wild ancestral form *V. mungo* var *silvestris*. It is grown in various agro-ecological conditions and cropping system with diverse agricultural practice. It is cultivated in a large groups compared to rice – cultivation in India .It considered as a protein rich pulses.

A highly reproducible regeneration system through induction of somatic embryogenesis from the 7 days old seedlings (invitro germinated seeds) of black gram leaves were developed. The regeneration of plants via somatic embryogenesis liquid shake culture of embryogenic calluses was achieved in Vigna mungo (L.) Hepper (blackgram). The production of embryogenic callus was induced by seeding primary leaf explants of V. mungo onto Murashige and Skoog (MS) medium supplemented (optimally) with different concentration of /l 2,4-dichlorophenoxyacetic acid. The embryogenic callus was then transferred to liquid MS medium supplemented (optimally) with different concentration of l 2, 4-dichloro-phenoxyacetic acid. Globular, heart-shaped, and torpedo-shaped embryos developed in liquid culture.

Keywords *: Blackgram, seed, somatic, esmbryogenesis.*

INTRODUCTION

The present study was undertaken to establish an efficient and reproducible regeneration system for black gram (*Vigna mungo* L.), an important tropical grain legume rich in phosphoric acid.

The seeds have 60% carbohydrate, 24% protein and 1.3% fat on dry weight basis. Besides its utility for human consumption, it also serves as a nutritive fodder for milch cattle. The crop is used as green manure and its deep root system binds soil particles preventing erosion of the soil.

Black gram [*Vigna mungo* (L.) Hepper] is an important leguminous source of protein for a large segment of the vegetarian population in the developing countries of Asia. The seeds of black gram contain 78–80% nitrogen in the form of albumin and globulin (Das et al. 1998), and the dry seeds are also a good source of phosphorus. Severe yield losses in black gram crops, caused by a high incidence of viral diseases and fungal pathogens (Sahoo et al. 2002), have spurred research into the development of disease-resistant cultivars by genetic transformation. The first stage in transgenic crop production is the definition of good in vitro methods for shoot regeneration.

Because of its nutritional value, cooking quality and easy digestibility, the demand for this crop has been steadily increasing in the Indian subcontinent, making breeders more and more conscious about the urgent necessity to step up its production. The foremost problem of Black gram is its low yield. The factors contributing to its low yield may be summed up as follows- narrow genetic base, susceptibility to several diseases and pest, a year to year fluctuation in their productivity. Cultivated extent and production of black gram vary from year to year with a decreasing trend consequently, the production is not sufficient for the demand. Somatic embryogenesis can be suitable option for developing an asexual form of plant propagation method in nature which inhibits many factors of sexual reproduction. Somatic embryogenesis means to produce embryo by somatic cells. Somatic embryos are formed from plant cells that are not normally involved in the development of embryos, i.e. ordinary plant tissue. The establishment of embryogenic suspension cultures for the regeneration of plants is an ideal tool for the efficient in vitro selection and production of transgenic plants (Finer and McMullen, 1991; Christou, 1997). Somatic embryogenesis is the direct way to regenerate plant from single somatic cell and opens up possibility to understand process of cell cycle reprogramming from somatic to embryogenic type, cloning and characterization of genes involved in wounding, hormone activation, cell division, differentiation and developmental processes. This process also reproduced artificially by the manipulation of tissue and cell *in vitro*.

According to the study of Feher (2006), somatic embryogenesis may therefore occur if the genes responsible for the embryogenic development program are released from chromatin- mediated gene silencing in vegetative cells. This may happen in response to strong aspecific signal, such as high auxin dose and/ sub lethal stress which evoke the activation of large chromatin regions. Their hypothesis had explained why less differentiated cells (e. g. immature embryos) are more amenable for somatic embryogenesis and why various aspecific signals can evoke similar embryogenic response. Regeneration via direct somatic embryogenesis in liquid and solid media for *M. truncatula* also has been established **(**Iantcheva A et al., 1999; Iantcheva A et al., 2001; Iantcheva A et al., 2005**).** Somatic embryogenesis in the genus *Selenium* has been described for *S. candallii* (Mathur, 1991**).** An efficient and reproducible protocol for embryo formation and synthetic seed formation in *S. tenuifalium* plant was developed by using mature leaf tissue in presence of various conc. of 2, 4-D and NAA (Meena Joshi et al., 2006). An efficient and reproducible plant regeneration system through somatic embryogenesis was established in cassava by using somatic tissues, by which somatic embryos were developed directly from shoot tips and immature leaves on a medium containing 4-16 mg/ l 2, 4-D by Laszlo Szabados et al., 1987. Somatic embryos from immature cotyledon

explants of *Vigna mungo* (L). have been reported, which however, failed to form well developed plantlets (Eapen and George, 1990). Gyorgyey et al. (1991) had established a liquid culture system for mass production of somatic embryos of alfalfa (*Medicago sativa*) after initiating the embryos from callus on 2, 4-di chlorophenoxyacetic acid- (2, 4-D) containing semisolid medium. Similarly, Denchev et al. (1991) have described conditions for establishment of an embryogenic system based on liquid medium in *Medicago sativa, Medicago falcata*, and *Medicago trautwetery*. Repetitive somatic embryogenesis of peanut in liquid medium has been studied by Durham and Parrott (1992). It was studied that the use of 2, 4- D alone or in combination with other hormones has become almost routine and used successfully in inducing somatic embryogenesis in seed cultures (Huang and Yeoman, 1984; Mordhorst et al., 1998). Embryogenic suspension cultures have been established in only a few grain legumes- *Vigna unguiculata* (Kulothungan et al., 1995), *Cajanus cajan* (Anbazhagan and Ganapathi, 1999). Ontogeny of somatic embryo development has been studied only in a few legumes, i.e. Vigna species (Girija et al., 2000; Premanand et al., 2000), *Glycine* (Phillips and Collins 1981; Samoylov et al., 1998a, b), *Arachis hypogaea* (Ammirato, 1983; Eapen and George 1993), and *Phaseolus* (Martins and Sondahl, 1984; Kumar et al., 1988).

MATERIALS AND METHODS

Collection of Plant material

Seeds of black gram (LBG- 645) were obtained from the Indian Pulse Research Institute, Kanpur, U. P., India. Seeds were washed under tap water in presence of Tween – 20 and then disinfected with serial immersion in 2% sodium hypochlorite for 5 min, 70% ethanol (v/v) for 2 min, and 0.1% $HgCl_2$ (w/v) for 10 min. After three rinses with sterile distilled water, seeds were germinated on MS medium (Murashige and Skoog, 1962) containing 3.0% sucrose (w/v) and 0.8% agar (w/v) (Hi-media Co., Mumbai, India) at 25° to 28° C in the dark for the first 2 days and then transferred to a 16 hours photoperiod of cool-white fluorescent light (120 $\mu mol\ m^{-2}\ s^{-1}$). The pH of all the media was adjusted to 5.8 prior to autoclaving at 121° C temperature for 20 min.

Callus induction and maintenance of Embryogenic calli.

Primary leaves were excised from 7 days old seedlings, cut into small segments and cultured on 10 ml MS medium with 3% sucrose, 0.8% agar, and different concentrations of 2, 4-dichlorophenoxyaceticacid acid in thrice set-up as follows- 2, 4-D- (0.0, 0.3, 2.3, 4.3, 6.3, 8.3, 10.3, 12.3, 14.3, 16.3, 20.0 µM) for embryogenic callus induction. The culture tubes were capped with sterilized cotton plugs. The cultures were incubated at 25° C to 28° C temperature under a dark condition for 24 hour then kept in 16 hours light/ 8 hours dark photoperiod (Haque et al., 2009) with a light intensity of 120 $\mu mol\ m^{-2}\ s^{-1}$. The callusing was started after 12 days of inoculation and the pattern of the growth of callus was observed by measuring the diameter and % growth of the callus after every 15 days. This experiment was conducted in 3 replicates in multiple of 3 of each 2, 4-D concentration containing tubes. Callus growth and nature of calli produced in each concentration is mentioned in Table 1.1 and percentage of growth is indicated in Table- 1.2 and graph 1.0 whereas the observations of the effect of 2, 4-D concentration based upon the diameter of calli producing is mentioned in Table-1.3. The different form of regenerative calli, proliferartive calli producing shoot buds, regeneration of plantlet and regeneration of plant have been mentioned in Figure- 1.0, 1.1 and 1.2.

Maintenance of suspension culture and somatic embryogenesis

Two-week-old, greenish white, friable calluses (approximately 150 mg fresh mass) derived from leaf segments were aseptically transferred to a 250 ml flask containing 30 ml of liquid MS medium supplemented with 6.3 and 12.3 µM 2, 4-D. Cultures were agitated on a gyratory shaker at 130 rpm, 25° to 28° C, under a 16 hours light / 8 hours dark photo period of 120 µmol m^{-2} s^{-1} light intensity. A 15 ml aliquot of the cell suspension was replaced with fresh medium at 7 days intervals. Cell suspension culture allows rapid division of cells and increases the rate of the growth. Homogeneous cell suspension was formed after 1 month.

Differentiation of Embryogenic callus

Cell suspension cultures were observed under a microscope during the culture period. Embryos were sub cultured in liquid MS medium containing different concentrations of 2, 4- D. After 20 days of culture, torpedo-shaped embryos were transferred to full-strength MS liquid medium, MS supplemented with 6.3 and 12.3 µM 2, 4-D for maturation and germination. The germinated embryos were transferred to agar-solidified MS basal medium for further growth and development. The frequency of embryo induction and different stages of somatic embryos were observed.

Transplantation

The plantlets that developed from germinated embryos on solid MS medium were transferred to plastic pots containing vermiculite, sand, and red soil mixture (1:1:1). Each pot was covered with a polythene bag to ensure high humidity for the initial 15 days, and then the humidity was gradually reduced by making holes in the polythene bags to harden the plants. The hardened plantlets were nourished with half-strength MS nutrient solution. The hardened plants were established in soil and grown to maturity in a plant growth chamber under a 16 hours photoperiod at 25° to 28° C.

Statistical analysis

All the experiments were repeated three times and data on growth percentage of embryogenic calli and diameter of calli produced (mm) were statistically analyzed by set up in (CRD) completely randomized design (Appendix 1). The effect of different concentration of 2, 4-D was quantified and the level of significance was determined by analysis of variance F- value at the 5%.

RESULTS AND DISCUSSION

Callus induction

Primary leaf explants from seven days old seedlings produced greenish white friable calli on 2, 4-D containing medium within 10–12 days of culture. The maximum proliferation and nature of calli was obtained on 6.3 µM and 12.3 2, 4-D, while minimal response was noted at 0.3 µM (Table 1.1).

Cell suspension culture and embryogenesis

Two-week-old leaf derived greenish white friable calluses were sub cultured in liquid MS medium containing different concentrations of 2, 4-D. After 10-15 days of culture on MS medium supplemented with 6.0 µM 2, 4-D, cell division and proliferation was observed. The cultures became thick, mucilaginous, and brown in color after culture for 12 days in the same medium; therefore, it was necessary to transfer the cells to fresh medium at weekly intervals. Two weeks after initiation of suspension culture, cells differentiated to form somatic embryos. Microscopic observation of suspension cultures showed that initial spherical cells were embryogenic, containing visible dense cytoplasm. These spherical cells were embryogenic and divided transversely resulting into two, four, and subsequently to a group of cells, that was

considered to be the pro-embryo. The pro-embryo further divided and formed globular (Figure. 1.2- a), heart (Figure. 1.2- b), and torpedo- staged (Figure. 1.2- c) embryos. The torpedo shaped embryos recallused on 2, 4-D -containing medium. Heart and torpedo stages were transferred to fresh liquid medium containing 3% sucrose, for complete maturation. The differentiation of the embryogenic callus into different stages was examined under stereo microscope to identify the different stages of it (Figure. 1.2- a, b, c).

Germination of the embryos and transplantation

After transfer of torpedo and stage embryos from MS liquid to solid medium, the embryos germinated into tiny plantlets [Figure. 1.1- (A1-A6) and Figure. 1.2- (i, j)] within the same medium.

Media optimization

The effect of different concentrations of 2, 4-D (0.5-72.0 µM) in liquid MS medium was assessed on induction of somatic embryogenesis. It was observed that the frequency of somatic embryogenesis increased with an increase in the concentration of 2, 4-D from 0.5 to 6.0 µM (Table 1.2 and graph.1.0). Further increase in 2, 4-D concentration resulted in a decrease in embryogenic calli production and recallusing of embryos. Calli were not obtained in MS medium containing NAA (Figure- 1.2). The various concentrations of plant growth regulators (NAA, and 2, 4 –D) were tested in callus induction and plant regenerations. Observations based on growth percentage and size of calli forming embryo were collected. Mean of growth percentage was found to be increased 86.67 with an S. Er. (+) of 6.67 at conc. of 6.0 µM 2, 4 D whereas a decrease in mean growth % i. e 13.33 with an S. Er. (+) of 33.0 was noted at 0.5 µM of 2, 4-D. It is observed that the highest growth percentage of somatic embryo was produced in MS media supplemented with 6.0 µM 2, 4-D as shown in Table 1.1 and Graph 1.0. These results were analyzed statistically by using CRD (Complete randomized design) analysis. After calculating the ANOVA table the F-value (Appendix I) was found to be 6.273 which indicates the significance at the tabulated value (5%) of F with a C.D. (critical difference) (5%) of 25.828 ($F_{6.27}$>5%). The influence of different concentration of 2, 4-D depending upon the size of calli produced was also studied by using a CRD test (Table-1.2 and Appendix- I) and analysis of variance (5%). The highest mean of diameter of embryogenic calli – 2.43 mm with a S. Er. (+) 0.07 was found at the concentration of 6.0 µM and the minimal mean of size of calli was found 0.77 mm with S. Er. (+) 0.5 at the 1.5 µM concentration of 2, 4- D. After calculating the ANOVA table, F- value (Appendix II) was found to be significant- 6.4570, which is greater than F- table value- 2.32 (5%) with a C. D. of 0.77 at 5%.

The choice of initial explant is a critical factor for embryogenic callus induction and initiation. In the majority of legumes, immature zygotic embryos, young cotyledons, or vegetative shoot apices have been the most responsive explants for the induction of somatic embryogenesis (Hardwick et al., 1988). In the present study, leaf segments were found to produce somatic embryos. The acquisition of embryogenic potential under auxin stimulus in such explants is manifested through a callus phase. Among different auxin tested, 2, 4-D at 6.0 µM was most effective for inducing somatic embryogenesis in a liquid medium. NAA failed to induce somatic embryogenesis (Figure- 1.2), indicating that leaf segments have different sensitivity to various auxin and their concentration. In *Vigna* species, Full-strength MS medium was found to be more effective than the other media used for induction and growth of somatic embryos. This may be due to the presence

of a high level of nitrogen, particularly the reduced form (NH_4PO_4), in MS medium. The use of the synthetic auxin 2, 4-dichlorophenoxyacetic acid (2, 4-D) for the induction of somatic embryos (embryoids) oncultured explants can be traced to the work of Halperin and Wetherell (1964) who showed that a callus produced from any vegetative part of carrot (*Daucus carota*) such as the root, petiole, or inflorescence stalk reared in a medium containing a high concentration of 2, 4-D formed somatic embryos upon transfer to a medium with a reduced level of the auxin. From this timeonwards, the use of a defined medium and a single-step transfer of a callus or a cell suspension growing in a medium supplemented with a moderate quantity of 2, 4-D to one containing a reduced amount of the auxin or none at all, was adopted as the standard protocol to study the somatic embryogenesis in carrot and became widely popular in inducing somatic embryogenesis in a broad range of species (Thorpe and Stasolla, 2001; Raghavan, 2004 (a)). The role of 2, 4- D by continuous exposure for successful induction of somatic embryogenesis was described by Raghavan, 2004 (b). It was observed that using 2, 4-D as the sole hormone, heart-shaped embryos were initially cultured in a liquid medium containing 6.0 µM 2, 4-D for 21 days to induce the formation of early-stage somatic embryos and shoot buds followed by their transfer to an auxin- containing medium for plantlet formation and regeneration of plant as shown in Figure- 1.6 and 2.0. It was observed that using 2, 4-D as the sole hormone, calli were initially cultured in a liquid medium containing 6.0 µM 2, 4-D for 21 days used to induce the formation of proliferating calli. In the present study it was observed that some types of embryos transferred for germination had also produced callus (dedifferentiation). This result is found in live with the report on *Laptadenia reticulata* (Hariharan et al. 2002). This work also showed that itwas possible to obtain cell lines with continued embryogenic potential if early-stage somatic embryos were maintained on a solid medium with an increased concentration of the auxin; this observation is in accordance to the protocol developed by Ikeda-Iwai et al. (2002). In the present study, a protocol for somatic embryogenesis was established successfully and found to be reproducible and developed by using different concentration of 2, 4-D in increasing order from 0.5 – 72.0 µM concentration in which the best proliferation and embryo formation was observed at 6.0 µM. These results are in accordance to finding of *in vitro* regeneration of plant via somatic embryogenesis through cell suspension culture achieved in horse gram (S. Varisai Mohamed et al. 2004) by addition of different concentration of 2, 4- D.

Induction of callus in plants is affected by many factors, like explants, PGRs (Plant growth regulators) and culture conditions. Among them, PGRs play a very key role. Furthermore, different concentrations and combinations of PGRs have significant effects on callus induction, which has been reported in many researches (Poeaim et al., 2005; Sun et al., 2006). Friable callus, developed from leaf and internode explants grown on Murashige and Skoog (MS) medium supplemented with 2, 4-dichlorophenoxyacetic acid (2, 4-D), underwent somatic embryogenesis has been reported in *Ceropegia candelabrum* L. (Beena and Martin, 2003).

The results of this study revealed that 2, 4-D was the most important PGR in callus induction, followed by NAA. The frequency of embryogenic callus formation had a dramatic drop with the concentration of 2, 4-D rising and reached highest when 2, 4-D was lowest. From this study, It was observed that low concentration of 2, 4-D is helpful

for embryogenic callus formation from leaf explant whereas a successful somatic embryo was developed from the roots of *Panax ginseng* by *Chang* and Hsing, 1980 and *Lycium barbarum* by Hu et al., 2008 as well as Wang found that high concentration of 2, 4-D showed a promoting effect in *Areca catechu* (Wang et al., 2006). In *H. brasiliensis*, embryogenic callus from the pollen (Chen et al., 1979) and inner integument of the seed (Carron, 1981) was induced by high concentrations of 2, 4-D. The results of present study was found to be opposite as compared to those mentioned above. It may be due to different explants used.

A study has been done by Amoo and Ayisire 2005 to produce plantlet by induction of somatic embryogenesis from cotyledon explants of *Parkia biglobosa* (Jacq.) Benth.They observed the effect of naphthalene acetic acid (NAA) or 2, 4-dichlorophenoxyacetic acid (2, 4-D) on embryogenic callus induction and noticed that with 2, 4-D, response in the form of callus production was observed only at the cut edges of the explants and on the abaxial surface, even when placed face down. Present result shows the finding that callus formation in a few cases is affected among other factors by orientation of the explants on the culture medium (Warren, 1991). This report agrees with the findings of Morini et al. (2000) in which they observed that callus formation occurred only on the abaxial surface of *Cydonia oblonga* leaf, which had been placed face up. Rita and Floh (1995) reported similar observation with the leaf explants of *Cuphea ericoides*. **The fact that callus was induced by 2, 4-D but not by NAA suggests that cotyledon explants of *Vigna mungo* are auxin specific.** Zafar et al. (1995) also reported callus induction from cotyledon, hypocotyl and root explants of *Medicago littoralis* in the presence of 2, 4-D alone and when it was replaced with NAA, the explants either died or showed poor differentiation similar to the present finding. Harvey and Grasham (1969), while working on 12 species of conifers also reported species specificity for IAA, NAA and 2, 4-D in their effectiveness for callus induction. Callus production from cotyledon explants of *Juglans nigra* (Neuman et al., 1993) and seedling explants of *Albizzia procera* (Datta, 1987), all of which are woody trees have also been reported. In this study, callus production was successful in the presence of 2, 4-D alone. This is in contrast to the observation by Xie and Hong (2001) in *Acacia mangium* where calli were reportedly induced from cotyledon explants of mature zygotic embryos in MS basal medium supplemented with both 2,4-D and Kinetin. The choice of suspension culture was informed by the work of Martin (2003), who reported the development of higher number of somatic embryos in suspension cultures than in solid medium cultures. Callus production followed by somatic embryogenesis has also been reported in cotyledon explants of *Juglans nigra* (Neuman et al., 1993), leaf explants of *Holostemma ada-kodien* (Martin, 2003) as well as in stem petioles and leaflet explants of *Swainsona formosa* (Sudhersan and Abo El-Nil, 2002).

A highly reproducible regeneration system through somatic embryogenesis from the excised mature embryos of dry seeds of a range of European barley cultivars *(Hordeum vulgare L.)* was developed by minimizing the induction of primary callus and following influences like - the ratio of carbon source and 2, 4-D in the induction medium, soaking of seeds in water containing 2, 4-D solution and direct culture of excised embryonic axes (Sharma et al. 2005). The role of 2, 4-D was also studied by Pitipong Thobunluepop, 2009 on the *in vitro* evaluation and optimization of medium for somatic embryogenesis, synthetic seed production

in sweet corn (*Zea mays* var. *saccharata* variety FAH01),- a herbaceous monocot. Embryogenic callus were derived from culturing immature zygotic embryos on N6 medium with 2, 4-D 2 mgl^{-1} and sucrose 60 gl^{-1}. It was observed that sucrose and 2, 4 - D supplemented in N6 medium has also significantly affected on sweet corn callus initiation. The influence of plant growth regulators (PGRs) including 2,4-dichlorophenoxyacetic acid (2, 4-D), 6-benzylaminopurine (6-BA) and kinetin (KT) on callus induction of root explants of *Hevea brasiliensis* from *in vitro* plantlets were studied by Zhou et al. 2010.

Table - 1.1 : Response of leaf explant with respect to callus induction and nature of the callus on 2, 4-D containing MS medium. (WGF- whitish green friable; GF-green friable; GYF-greenish yellow friable; WGF- whitish green friable ; YGF- yellowish green friable; ; YGF- yellowish green friable; GF-green friable; GF- green friable; WGF- whitish green friable).

2, 4-D (µM)	Callus induction (%)	Callus nature
0.00	–	–
0.5	+	WGF
1.5	++	GF
3.0	++++	GYF
6.0	+++++	WGF
8.0	++++	YGF
12.0	++++	YGF
36.6	+++	GF
54.2	++	GF
72.3	++	WGF

Table - 1.2 : The Influence of 2, 4-D conc. on growth percentage of embryogenic callus induction from explant of black gram.(* mean % of three replicates of same treatment).

S. N.	Concentration of 2, 4-D (µM)	R_1 *	R_2 *	R_3 *	Mean % of calli growth	S. Er. (+)
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.5	0.00	40	0.00	13.33	33.0
3	1.5	40	40	20	33.33	12.3
4	3.0	70	70	60	66.67	6.67
5	6.0	100	80	80	86.67	6.67
6	8.0	40	90	75	68.33	28.44
7	12.0	60	40	75	58.33	18.33
8	36.0	60	35	60	51.67	8.33
9	54.0	40	50	50	46.67	6.67
10	72.0	30	38	40	36.0	6.00

Table - 1.3 : Growth pattern of calli on the basis of diameter (mm) after 25 days of inoculation (3 replicates of same hormonal conc (*- mean of 3 replicates on same hormonal conc).

2, 4-D. (µM)	Size of explant	I* (Mm.)	I* (Mm.)	I* (Mm.)	mean	S. Er. (+)
0.00	0.5	0.00	0.00	0.00	0.00	0.00
0.5	0.5	1.6	1.2	1.0	1.10	0.50
1.5	0.5	1.2	0.6	0.5	0.77	0.43
3.0	0.5	2.4	2.5	2.2	2.37	0.13
6.0	0.5	2.1	2.7	2.5	2.43	0.27
8.0	0.5	2.5	2.3	2.5	2.43	0.07
12.0	0.5	0.7	2.1	2.4	1.73	0.77
36.0	0.5	2.2	1.1	2.0	1.73	0.37
54.0	0.5	2.4	2.3	2.3	2.33	0.07
72.0	0.5	1.1	0.6	1.3	1.00	0.30

Graph - 1.0 ; Effect of 2, 4-D on growth percentage of embryogenic calli

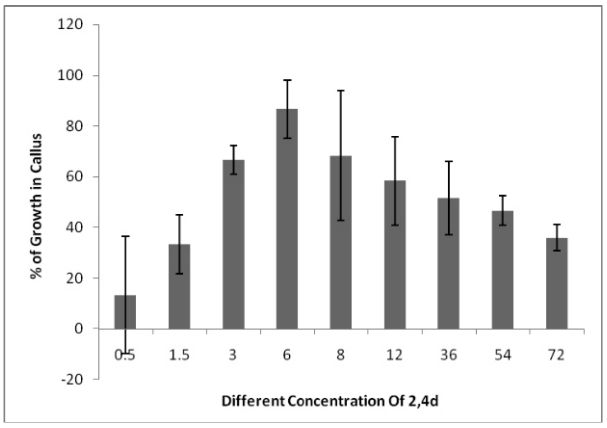

Figure - 1.0 : Different stages of embryo (a- globular embryo, b- heart shaped and c- torpedo stage embryo)

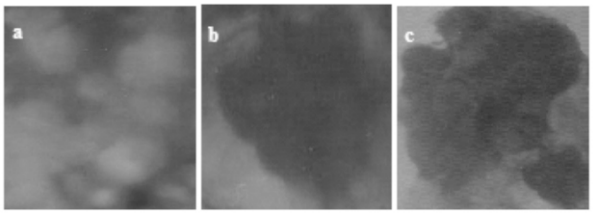

Figure - 1.1 : Different stages of embryogenic callus. A1 and A2- globular embryo development from callus and different stages embryo which could not be differentiated, A2- shoot tip containing embryogenic calli, A3- root development , A4- tiny plantlet development from shoot tips, A5- leaflet development, A-6- regeneration of plant by rooting and shooting.

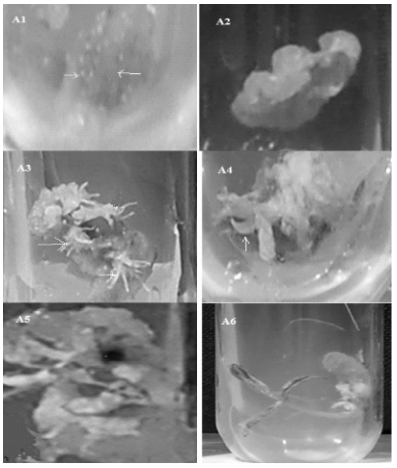

Figure - 1.2 : *In vitro* regeneration of black gram plant by induction of somatic embryogenesis.

CONCLUSION

In present investigation, a protocol for shoot buds and plantlet regeneration was established successfully by induction of somatic embryogenesis and found to be reproducible and developed by using different conc. of 2, 4-D in increasing order from 0.5 – 72.0 µM conc. in which the best proliferation and shoot buds formation was observed at 6.0 µM concentration (Graph-1.0, Table-1.2 and Figure- 1.5(A6), 1.6, 2.0). In conclusion, using plant growth regulators, the efficient embryogenic regeneration from leaf explant of black gram has been standardized. The Leaves originated callus could serve as an ideal starting material for developing an efficient black gram transformation system. Such protocols have a great potential for improvement of this crop by biotechnological approaches such as *in vitro* selection, clonal propagation, genetic transformation, and production of transgenic plants. In conclusion, a protocol for somatic embryogenesis was found to be reproducible from embryogenic culture of black gram. It was possible to produce

somatic embryos with in two months and to regenerate plant from mature embryos in 2- 3 months in presence of 2, 4-D.

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SCREENING OF EFFICIENT AM FUNGI FOR VIGOROUS PLANT GROWTH OF WHEAT

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ABSTRACT

In present study response of wheat to Different Species of arbuscular mycorrhizal inoculation was studied. To identify suitable AM species for wheat, 6 AM fungi, belonging to *Glomus fasciculatum, Glomus arborence, Glomus intraredix, Glomus diaphanum, Glomus hoi*and*Acaulosporamellea*were screened for good plant growth and yield of Wheat. All *AMF* inoculants increased plant height, fresh weight per plant, yield per plant and dry weight per plant significantly as compared to un- inoculated Plants.

Keywords *: AM fungi, plantgrowth wheat.*

INTRODUCTION

Wheat (*Triticum* spp.) is a cereal grain, originally from the Levant region of the Near East but now cultivated worldwide and belonging to the family Poaceae (graminae). In 2013, world production of wheat was 713 million tons, making it the third most-produced cereal after maize (1,016 million tons) and rice(745 million tons). Wheat was the second most – produced cereal in 2009, world production in year 2015 was 733.14 million tons, after maize (817 million tons) and with rice as a close third (679 million tons). This grain is grown on more land area than any other commercial food. World trade in wheat is greater than for all other crops combined. Globally, wheat is the leading source of vegetable protein in human food, having higher protein content than other major cereal, maize (corn) or rice. In term of total production tonnages used for food, It is currently second to rice as the main human food crop and a head maize, after allowing for maize's more extensive use in animal feeds. The archaeological record suggests that this first occurred in the region known as the Fertile Crescent.

In 100-gram, wheat provides 327 calories and is an excellent source (more than 19% of the Daily Value, DV) of multiple essential nutrition such as protein, dietary fiber, manganese, phosphorus and niacin. Several B vitamins and other dietary minerals are in significant content. Wheat is 13% water, 71% carbohydrates, fat 1.5% 13% protein.

Wheat is grown on more than 218,000,000 hectares (54,000,000 acres), larger than for any other crop. World trade in wheat is greater than for all other crops combined. With rice, wheat is the world's most favored staple food. It is a major diet

component because of the wheat plant's agronomic adaptability with ability to grow from near arctic region to equator, from sea level to plains of Tibet, approximately 4,000 m (13,000 ft) above sea level. In addition to agronomic adaptability, wheat offers ease of grain storage and ease of converting grain into flour for making carbohydrate in majority of countries.

Wheat protein is easily digested by nearly 99% of the human population (all but those with gluten-related disorders), as is its starch. With a small amount of animal or legume protein added, wheat – based meal is highly nutritious.

In present study response of wheat to arbuscular mycorrhizal inoculation was studied. Mycorrhiza literally means fungus roots. Frank (1985) coined the term for the symbiotic association of fungi with vascular plants. Three general types of mycorrhizal associations have been recognized: 1) Arbuscular mycorrhiza, 2) Ectomycorrhizae, 3) Ericoid or Ecto-endo mycorrhizae. Over a long period of time, specific climate and edaphic factor have been responsible for the selection of the distinctive type of mycorrhizae being associated with defined vegetation type. Species with ericoid mycorrhizae are predominantly present in soil of high altitudes and latitude, ectomycorrhizae species predominant in forest ecosystem of intermediate altitudes and latitudes and plant with AM dominant herbaceous and woody plant communities on mineral soils at low latitudes (Read 1991). Present study consisted of arbuscular mycorrhizae (AM) fungi, which are common in Bundelkhand region. Mycorrhizae have received considerable attention in recent years because mycorrhizal plants have several advantages over non-mycorrhizal plants. Mycorrhizal association enhances mineral nutrient acquisition, especially phosphorus (P), which is relatively immobile in the soil. Mycorrhizal fungi enhance water transport in plant (Safir*et al* 1971), decrease injury (Menge*et al* 1984), promote establishment of plant in wasteland and reduce the vulnerability to diseases caused by soil borne pathogen (Schonbeck 1979). In Present study the main object is testingof best AM species for vigorous plant growth.

MATERIALS AND METHODS

The study was conducted at institute of Agricultural Sciences (IAS) Bundelkhand University, Jhansi, Uttar Pradesh, India (24 “11“N latitude, 78 “17 “E longitude and 271 m above msl). In Uttar Pradesh, Bundelkhand region in the central plains of India composed of 13 districts covering a total area of 7.08 m ha, of which six districts with 4.12 m ha area are in Madhya Pradesh (MP) and seven districts with 2.94 m ha area in Uttar Pradesh (UP). On agro-ecological zone map of India, Jhansi lies in 4agro-ecoregion Northern Plain and Central Highlands, Hot Semi Arid Ecoregion with Alluvium derived Soil.

Three distinct seasons are recognized in a year. Summer (March-Mid June) is hot and dry, rainy seasons (Mid-June – September) is warm and wet, and winter (October – February) is cool and dry. Means annual rainfall is 960 mm with an average of 52 rainy days per year. Most of the rainfall is received during the monsoon season, which beings in the last week of June 26th Standard Meteorological Week (SMW) and remains active till the first week of September (36th SMW). Mean maximum temperature range from 47.4C (June) to 23.5C (January) and mean minimum temperature from 27.2C (June) to 4.1C (December). Diurnal variation in temperature is quite high. May and June are the hottest months. The maximum recorded temperature on a particular day often touches 47-48C during summer. Evapo-transpiration rate ranges from a high of 13 mm per in May to a low of

1.5 mm per day in December.

SCREENING FOR EFFICIENT AM SPECIES

To identify suitable AM species for wheat, 6 AM fungi, belonging to ***Glomus fasciculatum, Glomus arborence, Glomus intraredix, Glomus diaphanum, Glomus hoi*** and ***Acaulosporamellea*** were screened for good plant growth and yield of Wheat. Purified culture of ***Glomus fasciculatum, Glomus arborence, Glomus intraredix, Glomus diaphanum, Glomus hoi***and***Acaulosporamellea*** were procured from national Research Centre for Agroforestry, Jhansi. Black soil was used as potting mixture, soil was passed through 2 mm, sieve, soil spread out for the three days in open sunlight. Seed of wheat were surface sterilized with 0.1% mercuric chloride for 2 minutes, followed by 3 rinses in sterile distilled water. Soil was potted in 7-8 kg capacity pots(36 X 24 cm). At the time of sowing, 50 gm of mycorrhizal inoculum was replicated three times. The pots were kept under natural condition and watered as and when required. After germination one healthy plant were maintained in each pot. After five month of sowing, the plant were harvested carefully and analyzed for following parameters.

- Biomass production in term of plant fresh/dry weight: Plants were washed in tap water followed by 0.1% HCL and repeated washing with de-ionized water. Plants were gently blotted on to a blotting paper and plant height and fresh weights were recorded. Samples were dried in the oven at 68°C for 48 hours. Plant height theirdry weights were subsequently recorded.
- Plant height
- Total yield / Plant

3.7 STATISTICALANALYSIS

Treatment effects were determined by analysis of variance (ANOVA) using CRI. All the data on plant growth parameter were subjected to one-way analysis of variance. For each factor **analyzed,** the means of the different treatments were compared and ranked using Fischer F test ($P<0.05$). The mean of the experiment was analyzed statistically using a general linear model (GLM) for analysis of variance in CRD. Least Significant Difference (LSD) was used to compare treatment differences. The statistical analysis was performed by using statistical package SYSTAT version 11 (Wilkinson and Coward 2004).

RESULTS AND DISCUSSION

All AMF inoculants increased plant height, fresh weight per plant, yield per plant and dry weight per plant significantly. Maximum plant height was recorded in *G. intraradices* (72.3 cm.) and *A.mellea*(72.3 cm.), followed by *G. arborense* (71.7 cm.)*, G. diaphanum* (71.0 cm.), *G. hoi* (70.1 cm.) and *G. fasciculatum* (69.0 cm.) as compared to un-inoculated pots with DAP (57.3 cm.).

Maximum fresh weight per plant was recorded in *G. hoi* (14.9 gm.) followed by and followed by *A. mellea*, (14.0 gm.) *G. diaphanum*(13.2 gm.), *G. fasciculatum* (13.1 gm.) and *G. arborense* (12.5 gm.) and *G. intraradices* (11.8 gm.) as compared to un- inoculated pots with DAP (10.0 gm.).

Maximum yield per plant was recorded in *G.fasciculatum* (3.0 gm.) followed by *A. mellea*, (2.7 gm.), *G. intraradices* (2.7 gm.), *G. arborense* (2.7 gm.), *G. diaphanum*(2.5 gm.) and *G. hoi* (2.5 gm.) as compared to un- inoculated pots with DAP (1.5 gm.).

Maximum Dry weight per plant was recorded in *G. hoi* (3.6 gm.) followed by *A. mellea*, (3.5 gm.), *G. fasciculatum* (3.1 gm.), *G. arborense* (2.9 gm.), *G. intraradices* (2.5 gm.) and *G. diaphanum*(2.2 gm.), as compared to un- inoculated pots with DAP (1.0 gm.).

Table - 1 : Effect of inoculation of bio-fertilizers (AMF) with chemical fertilizer (DAP)on plant height, fresh weight, yield and dry weight per plant of *Triticum aestivum*:

Treatments	***Plant height (cm)***	***Fresh weight plant^{-1} (g)***	**Yield plant $^{-1}$ (g)**	**Dry weight plant^{-1} (g)**
DAP + *G. intraradices*	72.3	*11.8*	2.7	2.5
DAP + *G. diaphanum*	71.1	*13.2*	2.5	2.2
DAP + *G. hoi*	70.2	*14.9*	2.5	3.6
DAP + *A. mellea*	72.3	*14.0*	2.7	3.5
DAP + *G. arborense*	71.7	*12.5*	2.7	2.9
DAP + *G. fasciculatum*	69.1	*13.1*	3.0	3.1
DAP + Control	57.3	*10.0*	1.5	1.0
S. Em. ±	0.54	*0.53*	0.05	0.49
$LSD_{0.05}$	1.6	*1.62*	0.16	1.51

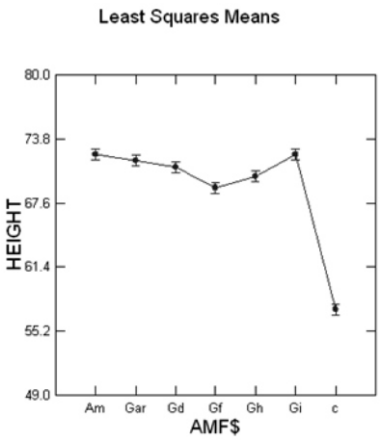

Fig. - 1 : Effect of inoculation of bio-fertilizers (AMF) with chemical fertilizer (DAP) on plant height / plant of *Triticum aestivum*

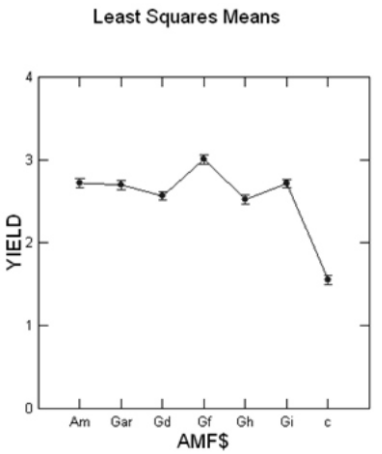

Fig. - 3 : Effect of inoculation of bio-fertilizers (AMF) with chemical fertilizer (DAP) on Yield / plant of *Triticum aestivum*

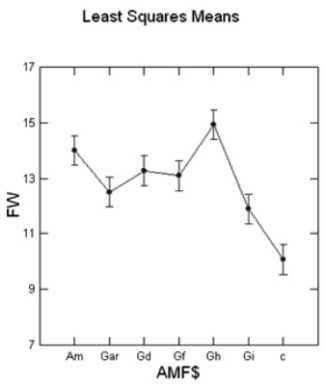

Fig. - 2 : Effect of inoculation of bio-fertilizers (AMF) with chemical fertilizer (DAP) on fresh weight / plant of *Triticum aestivum*

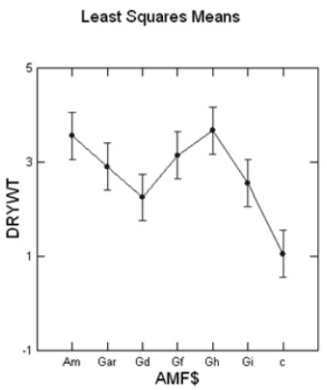

Fig. - 4 : Effect of inoculation of bio-fertilizers (AMF) with chemical fertilizer (DAP) on Dry weight / plant of *Triticum aestivum*

It shows the importance of AM inoculations.This shows that Wheat depends heavily on AMF for its Biomass and grain yield production. The increased growth and seed yield in Wheat could be attributed to increase in the soil volume explored for nutrient and water uptake by the mycorrhizal plant from soil solution as compared to increased to non-mycorrhizal plants. Better nutrients and water uptake lead to increase in biomass (Sieverding 1991). The results are in agreement with existing reports on beneficial effect of AM inoculations on pea and other crops (Laponin*et al* 1999).

Above results showed that Plant growth and yield of Wheat can further be increased by inter rating chemical fertilizer, farm yard manure and other bio-fertilizers, like *Rhizobium* and phosphorus solubilising bacteria (*PSB*). To realize full potential of mycirrhiza technology, further work is required on following aspects.

1. Screening of AMF in non-autoclaved (natural) soils.
2. Identification of AM responsive varieties of wheat.
3. Experiments on integrated nutrient management, involving FYM, chemical fertilizers and other bio-fertilizers.

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FREQUENCY OF DIABETES MELLITUS IN THE URBAN POPULATION OF JABALPUR DISTRICT, INDIA

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ABSTRACT

In present times the frequency of diabetes mellitus has been found to be on rise worldwide with special reference to the developing or under-developed countries in past 2 – 3 decades. For detection at an early stage, consistent screening of adult population is a must followed step. In India, the number of cases ae on a rise. Jabalpur district in Madhya Pradesh is a developing area in the country due to which the means of studies on this disease is very limited. There is a need for increasing the awareness among people. This study has been undertaken to access the frequency and knowledge through cross-sectional as well as household approaches. A questioned survey was conducted among the adult population in different areas of the district to examine their knowledge about the disease and blood screening tests were conducted to detect diabetes. The frequency was found to be highest in the Wright Town area (about 18%) while lowest in the Adhartaal area (about 11%). These datasets are essential in order to plan the policies for public health the special reference to the execution of National Diabetic Control Program.

Keywords *: Diabetes mellitus, knowledge, cross-sectional study*

INTRODUCTION

India is second most populous country in the world, now has more people with type 2 diabetes (more than 50 million) compared to any other nation. The occurrence of diabetes has been well documented in a battery of recent papers (Shaw *et al* 2010, Magliano *et al* 2010, Jowett 2009, Ramachandran 2010, Mohan 2010, Pradeepa 2010). These publications were foreshadowed by studies of previously Westernized Indian populations elsewhere, and they illuminate distinctive features of diabetes in India. Type 2 diabetes results from a genetic pre-disposition and from lifestyle factors, especially those of the so-called Western lifestyle, characterized by high calorie intake and little exercise. Also known as non-insulin-dependent or adult-onset diabetes, this form of the disease is far more common than type 1(insulin dependent or juvenile-onset) diabetes. Until recently, type 2 diabetes was viewed as a disease of overfed, sedentary people of European ancestry. But it is now exploding around the world owing to the spread of Western habits. In India, a wide range of outcomes for different groups is buried within the average diabetes prevalence of 8% (Mohan et al. 2007, 2008b). Prevalence is only 0.7% for non-obese,

physically active, rural Indians. It reaches 11% for obese, sedentary, urban Indians; and it peaks at 20% in the Ernakulam district of Kerala, one of India's most urbanized states. Among lifestyle factors predicting the incidence of diabetes in India, some are familiar from the West; whereas others turn expectations upside down (Mohan *et al*. 2008a). In India, as in the West, diabetes is ultimately due to chronically high levels of blood glucose, and some of the clinical consequences are similar. The age of onset in India has been shifting towards every younger people even within the past decade among Indians in their late teens, 'adult-onset' diabetes already manifests itself more often than does 'juvenile onset' diabetes .Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. Depending on the etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production (Power et al. 2008). There are an estimated 40 million persons with diabetes in India in 2007 and this number is predicted to rise to almost 70 million people by 2025 by which time every fifth diabetic subject in the world would be an Indian (Sicree *et al*. 2006).

The objective of the study was to find out the prevalence of diabetes in the urban population of Jabalpur District, present study also finds out the diabetes in different age groups, educational status.

MATERIALS AND METHODS

A cross-sectional survey was done among adults aging 20 to 60 years in various locations of Jabalpur district including Wright Town, Napier Town, Vijay Nagar, Adhartaal, Hanumantaal, Gorakhpur, Loabour Chowk and Sadar area. An organized questionnaire was used to evaluate the information about diabetes as well as capillary blood screening test to enquire about the diabetes. Rudimentary data about knowledge, awareness, treatment practices and traditional beliefs and other parameters were included in the questionnaire. All families in the localities were visited and people were questioned and total 122 samples were collected. The study was based upon the STEPS approach of World Health Organization which involved queries pertaining to smoking, diet, alcohol consumption, physical activity as well as history of treatment for hypertension and diabetes mellitus. Physical parameters like weight, height, waist circumference as well as blood pressure were also recorded. The data was collected every Saturday and Sunday over the period of 9 months. The data was studied at RG Stone Hospital, New Delhi with the help of literature available in Research and Development Wing.

RESULTS AND DISCUSSION

The investigation discovered 289 males and 221 females with type 2 diabetes in the urban population of the district. Out of 510 subjects inspected, maximum persons 156, were in 30-39 years age group, trailed by 98 from 40-49 years age group, however only 17 were belonging to 60 year and above. The educational status of the population was also taken into consideration. About 38 subjects were uneducated. It was revealed that awareness about diabetes was much better in College going and Professionals as compared to illiterate and primary passed persons. Myths about the cure of diabetes was found to be highest in secondary and higher secondary persons.

Table - 1: Educational status of the studied population group:

S. No.	Characteristics	Male in No.	Female in No.	Total No.
1	Uneducated	17	21	38
2	Primary	58	42	100
3	Secondary	48	33	81
4	Higher secondary	84	16	100
5	College	45	23	68
6	professional	98	25	123

Frequency of diabetes in urban people of various cities is discussed in table 3, recent report of WHO-ICMR showed that commonness of self-reported diabetes was 7.3% in the urban population. Frequency of diabetes in India study (PIOSD), based on ADA criteria, the prevalence of diabetes in urban population was 4.7%.

Table - 2 : Prevalence of Diabetes in various studied places :

S. No.	Locality	Prevalence
1	Wright Town	18.2
2	Napier Town	16.1
3	Vijay Nagar	14.3
4	Adhartaal	11.3
5	Hanumantal	13.3
6	Gorakhpur	15.1
7	Labour Chowk	14.8
8	Sadar	12.5

The frequency of diabetes was evaluated in numerous areas of Jabalpur district i.e. Wright Town, Napier Town, Vijay Nagar, Adhartaal, Hanumantaal, Gorakhpur, Loabour Chowk and Sadar area. The occurrence was found to be highest in Wright town area *i.e*. 18% and lowest in Aadhartaal area *i.e.* 11%. Most of the population of Wright Town and Napier Town area is of High-Income Groups, following western life styles, suffering hypertension, consuming high calorie diets and living sedentary lifestyle. Due to these, this group of people are very much susceptible to the disease. On the other hand, the population of Adhartaal, where occurrence of diabetes is low, belonged to middle class income group.

Table - 3 : Prevalence of diabetes in urban India

Year	Author (Reference)	Place	Prevalence (%) of diabetes mellitus in Urban Population in different studies Since 1971
1971	Tripathy *et al*	Cuttack	1.2
1972	Ahuja *et al*	Multicentre (ICMR)	2.3
1978	Gupta *et al*	Multicentre	3.0
1984	Murthy *et al*	Tenali	4.7
1986	Patel[14]	Bhadran	3.8
1988	Ramachandran *et al*	Kudremukh	5.0
1989	Kodali *et al*	Gangavathi	2.2
1989	Rao *et al*	Eluru	1.6
1991	Ahuja *et al*	New Delhi	6.7
1994	Wander *et al*	Punjab	4.6
2000	Ramankutty *et al*	Kerala	12.4
2000	Zargar *et al*	Kashmir	4.0
2001	Ramachandran *et al*	National Urban Diabetes Study (NUDS)	12.1
2001	Misra *et al*	New Delhi	10.3
2001	Sadikot *et al*	Prevalence of Diabetes in India Study (PODIS)	5.6
2003	Gupta *et al*	Jaipur	8.6
2004	Agarwal *et al*	Rajasthan	1.8
2004	Ramachandran *et al*	Chennai	6.4
2004	Mohan *et al*	Chennai (CURES)	14.3
2005	Basavanagowdappa *et al*	Mysore	3.8
2005	Prabhakaran *et al*	Delhi	15.0
2006	Reddy *et al*	National	10.1
2006	Deo *et al*	Maharastra	9.3
2006	Menon *et al*	Ernakulam	19.5
2006	Chow *et al*	Andhra	13.2
2007	Raghupathy *et al*	Vellore	3.7
2008	Ramachandran	Tamil Nadu	18.6

CONCLUSION

Present study proposed to screen people above 20 years for type 2 diabetes to assess the occurrence and socio-demographic profile of participants. Maximum occurrence of diabetes in present study was 18% which proposes higher commonness of diabetes in Jabalpur which is very similar to any other developing cities. The conclusion in present study may be due to greater consciousness in target population. This study shows that the occurrence of diabetes in Jabalpur is similar to other municipal areas of northern and southern India. So, policy makers and public health sectors need to take the burden posed by diabetes seriously and some sort of precautionary programmes and screening strategies needs to be executed to contain this epidemic. Inactive life style, inappropriate food habits, late night working habits are most affecting reasons for diabetes. Consumption of alcoholic drinks and smoking customs leads to generation of free radical in body which also develops leads to diabetes.

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INCIDENCE OF UMBILICAL SEPSIS OMPHALITIS-A STUDY

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ABSTRACT

Present study 'the incidents of umbilical sepsis or Omphalitis' is made on Kailashi Poultry Farm, Ambedkar Nagar during 2014 to 2017. All the chicks were hatched out in the same hatchery and reared in deep litter (floor) brooding system. All of them were provided with compounded chick mash with required additives and *ad.lib.* water. Resultantly, the incidence of omphalitis was 19.1% (AV) in 2014, 25.0% in 2015, 25.9% in 2016 and 26.9% (AV) in 2017.

Key words : *Omphalitis, effect of season, incidence, gram positive and gram negative bacteria.*

INTRODUCTION

Omphalitis is an infection of the umbilical stump (Cushing, 1985). Aerobic bacteria are present in approximately 85 percent of infections, predominated by staphylococcus aureus, group A streptococcus, E. coli Ktebstella pheaumonae and protecus mirabilis (Airede, 1992, Brook, 1998, Mashon et al. (1989) Savardekan, 2004). S. aureus is also described with omphalitis infection (Sengupta et al. 2016). More recent reports implicate with both gram positive and gram negative bacteria in the etiology of some cases, anaerobic bacteria have been found (Brook 2011). Omphalitis occasionally mainfests from an immunologic disorder (Leacocyte Adhesion Disorder (LAD) is most prominent among the immunodeficiency syndromes (Hung et al. 1999). The overall incidence of omphalitis varies from 0.2 percent to 0.7 percent in industrialized countries (Mc Kenna and Jhonson, 1977). In full term infants, the mean age at onset is 5-9 days. In preterm infants, the mean age at onset is 3-5 days.

MATERIALS AND METHODS

Omphalitis or naval infection is characterized by failure of the naval opening to close properly, with resultant infection of the internal organs (Biester and Schwarte, 1969). Bacteria gain entry into the yolk sac either before or soon after hatching, multiply in the yolk, results in generalised septicaemic condition and ends in death of the chick. A study was undertaken to find out the occurrence of yolk sac infection in layer strain chicks for the period from 2014 to 2017 (4 years). Necropsy reports of all the layer strain chicks died were collected, classified, tabulated and analysed. The results were presented in the table. All the chicks were hatched out in the same hatchery and reared on floor brooding system. All of them were provided with compounded chick mash with required additives and ad libitum water. Brooder houses were

maintained well away from adult birds with separate attendants.

RESULTS AND DISCUSSION

The incidence of omphalitis was 19.1% (Av) in 2014, 25.0% in 2015, 25.9% in 2016 and 26.9% (Av) in 2017. The incidence was heavy in the months of February (21.1%), April (29.6%), July (38.0%), in August (28.0%) and in November (45.0%) in 2014. During 2015 it was more in the months of January (64.7%), February (47.0%), March (31.7%), August (24.0%), September (35.7%), October (22.2%) and in December (60.0%). In 2016 in the months of February (26.6%), March (36.6%), April (47.0%), May (27.5%), September (19.0%) and in December (22.6%) and in the year 2017 it was more in the following months, May (22.2%), June (40.0%), July (57.1%), September (77.2%), October (36.9%).

On postmortem examination a general odema of the abdominal muscles, an unabsorbed yolk and peritonitis were the common lesions observed. Often the contents of yolk were semisolid or more liquid invariably the yolk sac was ruptured.

In some cases, the yolk contents were caseaous in nature or yellow brown waterymaterial. In some, along with infection of yolk, pericarditis was noticed. Culture examination was taken up with a few samples only and only E. coli was isolated from them.

Sharma and Kousik (1986) recorded 25.12% of the mortality due to yolk sac in turkeys. Out of which 20.13% were diagnosed during winter and 4.99% in summer.

Sarma *et al.* (1985) isolated 14 strains of bacteria in cases of omphalitis and attributed that Gram negative bacteria was the causative factor for 76.50% of cases and Gram positive bacteria in 23.30% cases. They also observed that members of Enterobacterioceae including Salmonella species were found to be responsible for yolk sac infection.

Sharma and Kousik (1986) observed that no systematic efforts were made to identify the specific causal agents responsible for the retention of yolk sac recorded. However, faulty brooding was mentioned as the important contributory factor.

The present study has given an indication that the incidence was not specific for particular season or month but existing almost in all the months except in one or two months.

Regarding the source of infection, Seneviratna (1969) describes that soiled eggs, unhygienic condition of egg storage, high humidity in incubator and transfer to hatchery are the predisposing factor for transovarian infection. Volkmar (1929) observed that after the chick hatch the naval fails to close properly following drawing of the yolk sac into the abdominal cavity and infection thus gains entrance. He also stressed that the condition may be due to the increased content of bacteria of the air in the incubator at hatching time. Brandly (1932) reported that the condition may be related to the influence of high relative humidity in preventing normal enclosure of the yolk sac within the body cavity. Faecal contamination of eggs was considered to be the most important source of infection (Halfstead *et al.* 1972). Ardrey *et al.* (1968) described that ovarian infection or salphingitis may be responsible for the infection in chicks.

Coults (1981) described that the ability of an organism to cause yolk sac infection depends on its ability to degrade and break down protein.

Brandly (1932) noted that most of the losses from omphalitis occured with in 72 hours after hatching and the course of the disease was always rapid with death taking place from 2-8 hrs. The infection may carry to the internal organs particularly intestines. Sometimes peritonitis may be found when the yolk sac ruptures and mortality

may be as high as 10% (North, 1984).

In controlling this infection, cleanliness of the incubators especially at hatching time should be stressed as a possible means of preventing the disease. Hatchery sanitation is utmost importance. Hatchery rooms and equipment must be fumigated with formaldehyde and potassium permanganate mixture. It is necessary to fumigate the incubating eggs also. The fumigation should be repeated every second day till the infection is cleared (North, 1984).

Table - 1 : Incidence of Omphalitis in layer strain chicks for the period 2014-2017

Months	Years							
	2014		2015		2016		2017	
	No.	%	No.	%	No.	%	No.	%
Jan.	21/92	22.8	11/17	64.7	4/137	2.91	24/124	19.3
Feb.	45/213	21.1	8/17	47.0	19/73	26.0	21/235	8.9
Mar.	1/206	0.48	13/41	31.7	11/30	36.6	6/193	3.1
Apr.	8/27	29.6	10/124	47.75	40/85	47.0	13/73	17.8
May	6/75	6.6	0/78	0.0	27/98	27.5	14/63	22.2
Jun	4/35	11.4	1/74	1.4	4/38	10.5	26/65	40.0
Jul.	8/21	38.0	3/79	3.8	0/8	00.0	32/56	57.1
Aug.	7/25	28.0	6/25	24.0	0/9	00.00	3/37	8.1
Sep.	6/33	18.1	5/14	35.7	1/1	100.0	17/22	77.2
Oct.	2/23	8.7	4/18	22.2	0/2	00.0	31/84	36.9
Nov.	18/40	45.0	1/40	2.5	5/10	50.0	9/48	18.7
Dec.	0/21	00.0	39/65	60.0	7/31	22.6	1/41	2.4
Average		**19.1**		**25.0**		**25.9**		**26.9**

Percentage has been worked out for the total mortality in a month

The main causative organism, E. coli is sensitive to streptomycin, chloramphenicol, chlortetracycline, nitrofurans, neomycin, oxytetracycline and sufa drugs. It is important to determine the drug sensitivity before the drug being administered and which ever the drug is chosen, should be administered in an effective dose to the entire flock.

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HAEMATOLOGICAL STUDIES AND 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 *: Diabetes, blood sugar, selenium.*

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 haematological studies:

HAEMATOLOGICAL STUDIES:

a. Total RBC Count: By haemocytometer (Henry et al. 1989)

A drop of diluted blood was kept in the Neubauer's Chamber. The counting chamber was kept under light microscope and counting of RBC was done. The counting was done in 850 small squares of Neubauer's RBC counting chamber. Calculations of RBC were done by following formula after counting the number of red blood cells per cubic millimeter.

$$\text{No. of R.B.C./mm}^3 = \frac{\text{No. of RBC counted} \times \text{Dilution}}{\text{No. of small square counted}} \times 4000$$

The length of each small square was 1/20 mm and it had an area of 1/20 × 1/20 or 1/400 square millimeters. The depth of the counting chamber was 1/10 mm, hence the actual volume of the diluted blood in a small square was 1/400 × 1/10 or 1/4000 cubic millimeter when the dilution was 1:200.4000squaresmall90incounted.C.B.RofNumbermm/.C.B.Rof.No3×=

b. **Total WBC count:** By haemocytometer (Henry et al. 1989)

A drop of diluting blood was kept in the Neubauer's chamber. Counting chamber was kept under the light microscope. Each of these 4 WBC counting chamber having 16 small square had sides of 1 mm i.e. has an area = 1 × 1 = 1 square mm. The depth of the counting chamber was 1/10 mm. Therefore, the actual volume of the diluted blood in each of the 4 WBC square was 1 cubic mm. Calculation of WBC were done by following formula after counting the number of WBC in four WBC counting chambers.

$$\text{No. of R.B.C./mm}^3 = \frac{\text{WBC counted} \times \text{Dilution} \times \text{Depth factor}}{\text{Area of 1 WBC chamber} \times 4}$$

$$\text{No. of R.B.C./mm}^3 = \frac{\text{No. of WBC counted} \times 20 \times 10}{4}$$

$$\text{WBC per cu mm} = \text{WBC counted} \times 50$$

c. Haemoglobin Concentration (Hb):

Sahli's method was used for the estimation of hemoglobin percentage. This method required the use of the Sahli's haemoglobinometer or haemometer and a hemoglobin tube and a standard light brown glass rod. The hemoglobin pipette contained uniform diameter and a 20 cubic millimeter. Graduated hemoglobin tube was filled with N/10 HCl upto mark 10. The blood was sucked in the hemoglobin pipette up to mark 20 cubic mm. From pipette the blood were transferred to haemoglobin tube already containing N/10 HCl. The tube was thoroughly shaken and kept for 10 minutes. After 10 minutes the haemoglobin of the blood was converted into haematin. The addition of N/10 HCI was continued drop by drop into the haemoglobin tube till the colour matched with that of the standard brown glass rods. Reading was recorded on the haemoglobin tube at this point. Dilution of blood was read on the haemoglobin tube in terms of gram percent or grams per 100ml of blood.

d. Packed cell volume (PCV): Wintrobe's Tube Method

1.5 ml of blood was drawn into a dry and clean pasteure pipette avoiding air bubble in the

capillary stem. The Wintrobe's tube filled with blood was then centrifuged at the rate of 3,000 rpm for 30 minutes. This was necessary to create the required centrifugal force.

The upper level or red blood cell layer was recorded in Wintrobe's tube which was centrifuged again for fifteen minutes and reading was taken again. Readings were confirmed after getting two consecutive readings upper level of red cell layer in Wintrobe's tube. Upper most pale yellow layer was of plasma. Below plasma was a thin whitish layer of platelets and leucocytes and below this was the black line which marked the upper limit of red cell layer. The line was due to the presence of reduced hemoglobin of red cells lying adjacent to the whitish layer. The column blood in the Wintrobe's hematocrit tube was 100 ml. The volume of packed cell was read directly as percentage (Henry, 1989).

RESULTS AND DISCUSSION

Appearance of a drug or chemical in the blood depends upon the rate of absorption. When these agents are administered orally they reach to liver via hepatic portal system and reached to kidney through nephritic system. On the contrary, intraperitoneal administration the chemicals are mostly absorbed directly through the blood capillaries. The interactions of these agents with blood components may induce their effects. Furthermore the agents are carried to different organs after binding through specific proteins. Therefore the interaction with blood is the first reaction which can be judged to access the action of any chemical reagent used. Keeping in view these facts, it became desirable to know the effect of alloxan and micronutrients (Zinc, Selenium and Chromium) on hematological parameters *viz*. Red Blood Cells (RBC) count, White Blood Cells (WBC) count, Haemoglobin (HB), Packed Cell Volume (PCV), Blood Sugar, activity of SGOT (Serum Glutamic Oxaloacetate Transaminase) and activity of SGPT (Serum Glutamic Pyruvate Transaminase) in albino rats.

These findings may provide a clue to evaluate the use of oral administration of micronutrients in diabetic rats.

a. Total RBC Count

Control group (A):

In control group of albino rats, the total RBC count was 6.2 million/mm^3; in diabetic control group total no. of RBC count was observed to be 5.85 million/mm^3. Total erythrocyte count was found to be significantly decreased due to the diabetes in comparison to control group (Table-1, Fig.-1).

Selenium Treated group (C):

The total number of RBC in this group treated with zinc found 6.35 million/mm^3. The number of RBC found significantly ($P<0.05$) increased in comparison to diabetic and healthy control group (Table-1, Fig.-1).

b. Total WBC Count

Control group (A):

The number of total WBC in this group of albino rats was found 7400/mm^3; in diabetic control group total no. of WBC count was observed 7450/mm^3. Total leucocytes count was found to be slightly increased due to the diabetes in comparison to healthy control group (Table-1, Fig.-2).

Selenium Treated group (C):

The total number of WBC in this group treated with zinc found 7350/mm^3. The number of WBC found slightly decreased in comparison to diabetic and healthy control group (Table-1, Fig.-2).

c. Haemoglobin Concentration

Control group (A):

In control group of albino rats, haemoglobin concentration was 11.5 gm/dl; in diabetic control group haemoglobin was observed 11.2 gm/dl. Total

haemoglobin concentration was found to be slightly decreased due to the diabetes in comparison to control group (Table-1, Fig.-3).

Selenium Treated group (C):

In this group of albino rats, haemoglobin concentration was found 11.7 gm/dl. Total haemoglobin concentration was found to be slightly increased due to the selenium treatment in comparison to healthy and diabetic control group (Table-1, Fig.-3).

d. Packed Cell Volume

Control group (A):

In control group of albino rats, the packed cell volume was 45%; in diabetic control group 42%. The packed cell volume was found to be significantly decreased due to the diabetes in comparison to control group (Table-1, Fig.-4).

Selenium Treated group (C):

In this group of albino rats, the packed cell volume was 45%. The packed cell volume was found to be increased in comparison to diabetic control group (Table-1, Fig.-4).

Table - 1 : Effect of micronutrients on biochemical parameters in experimental diabetic albino rats.

Parameters	Healthy Control	Diabetic Control	Treatment			Significance value (P)
				Selenium		
Blood glucose (mg/dl)	110	185		137*		1.6325
± S.E.	±0.1232	±1.2406		±0.2252		
Glycogen (mg/dl)	11.0	21.4		13.2		1.2335
± S.E.	±1.1134	±1.3504		±0.6295		
Total Urea (mg/dl)	8.6	12.55		9.5*		1.4532
± S.E.	±0.1252	±0.1625		±0.3820		
Creatinine (mg/dl)	1.2	2.3		1.66		0.3425
± S.E.	±0.3422	±1.4550		±0.4552		
Total Cholesterol (mg/dl)	35.52	60.45		42.45		0.8592
± S.E.	±1.3112	±1.6520		±1.2558		

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

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

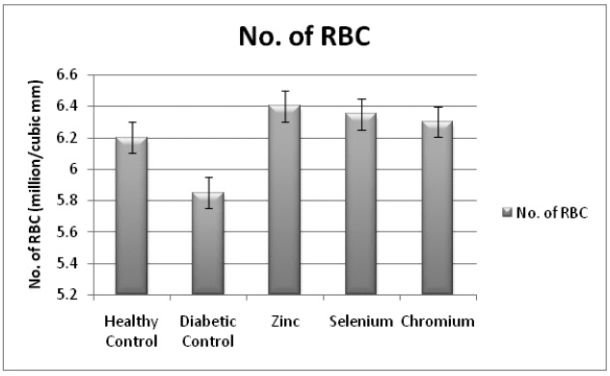

Fig. - 1 : Showing no. of RBCs in diabetic experimental albino rats in comparison to healthy control rats.

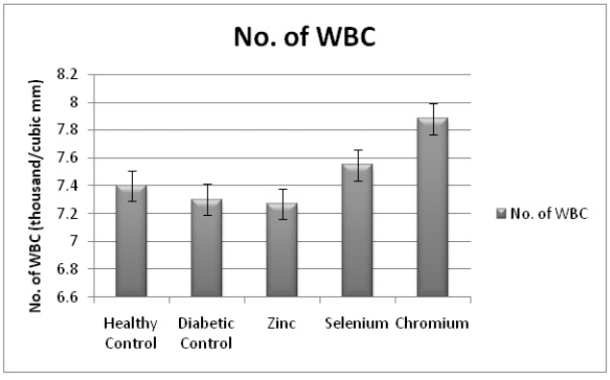

Fig. - 2 : Showing no. of WBCs in diabetic experimental albino rats in comparison to healthy control rats.

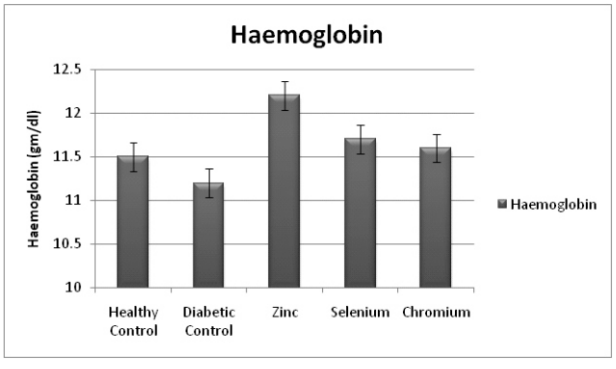

Fig. - 3 : Showing haemoglobin concentration in diabetic experimental albino rats in comparison to healthy control rats.

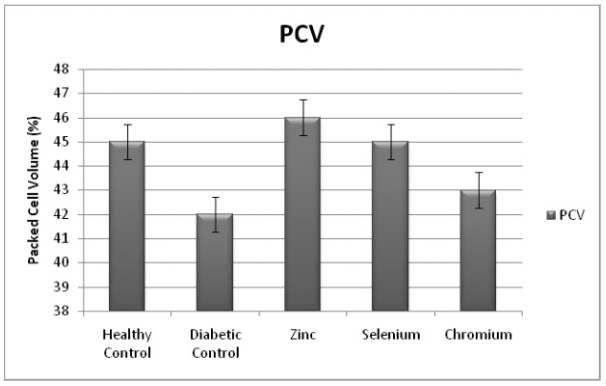

Fig. - 4 : Showing packed cell volume in diabetic experimental albino rats in comparison to healthy control rats.

RESULTS AND DISCUSSION

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.

Haematological Study:

In Selenium Treated Groups total number of RBCs increased in comparison to diabetic and healthy control group. Total number of WBCs found significantly decreased. Heamoglobin concentration was found to be significantly increased. Packed cell volume was found to be significantly increased.

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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STATISTICAL ANALYSIS OF AVIAN FAUNAL DIVERSITY AT RANI DURGAWATI VISHWAVIDYALAYA (RDVV) CAMPUS, JABALPUR, M.P.

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ABSTRACT

The present study was done at the Rani Durgawati Vishwavidyalaya famously known as RDVV, situated at Pachpedhi in Jabalpur in the state of Madhya Pradesh. The university was established in 1956 under the Jabalpur University Act, 1956 (Act number 22 of 1956). The university was reconstituted under MP VishwavidyalayaAdhiniyam, 1973 and given jurisdiction over Jabalpur, Mandla, Seoni, Balaghat, Narsinghpur, Katni, Dindori and Chhindwara. The university campus is spread over an area of about 100 acres accommodating administrative campus, various departmental buildings, playgrounds and residential quarters. In the present study, a total of 81 avian species have been recorded belonging to different families.Afterwards diversity indices were calculated based on the data collected.

Keywords *: Rani durgawati vishwavidyalaya, jabalpur, birds, faunal diversity.*

INTRODUCTION

Rani Durgawati Vishwavidyalaya or RDVV is a government university in Jabalpur district of Madhya Pradesh. It is also known as Jabalpur University or University of Jabalpur. It was named after the great Gond queen, Durgawati of Mandla district. The university was established in 1956 under the Jabalpur University Act, 1956 (Act number 22 of 1956). The university was reconstituted under MP Vishwavidyalaya Adhiniyam, 1973 and given jurisdiction over Jabalpur, Mandla, Seoni, Balaghat, Narsinghpur, Katni, Dindori and Chhindwara. The university campus is spread over an area of about 100 acres accommodating administrative campus, various departmental buildings, playgrounds and residential quarters. Major area of the campus is covered with lush green vegetation which houses a large number of floral and faunal diversity. Several species of mammals, reptiles and birds etc are spotted here. The natural forest and grassland has constituted a good habitat for many residential as well as migratory birds within the campus.

The faunal diversity of the study area includes many species of mammals, reptiles, insects, butterflies, dragonflies as well as spiders. A broad account of avian diversity in the state of Madhya Pradesh and Chhattisgarh was presented by

Chandra and Singh (2004). They reported 517 species belonging to 69 families from the areas. Similarly records of birds from Central Highlands of Madhya Pradesh were reported by Jayapal et al. (2005). In 2008, Ghosh *et al.* published a detailed account of avian fauna from the states of Madhya Pradesh (including Chhattisgarh), reporting altogether 449 species. Talmale *et al.,* in 2012 published an account of 173 bird species from Singhori Wildlife Sanctuary (Raisen District), Madhya Pradesh. Dubey *et al*. (2017) reported 56 avian species from Dumna Nature Reserve. Again 46 species of birds from Gun Carriage Factory Estate were recorded by them in same year. Similarly 118 species of birds belonging to 45 families were reported by Dubey *et al.* in 2018 from College of Material Management (CMM), Jabalpur. In similar context, 72 avian species belonging to 30 families were recorded by Bhandari *et al.* in 2018 from Ordnance Factory Khamaria (OFK) Estate. In the present study, the data was collected during the years from 2016 to 2018 which resulted in recording a total of 81 avian species belonging to different families.

Table - 1 : List of avian species recorded RDVV Campus

S. N.	Name of Spceies
1	Common Teal *Anas crecca* Linnaeus, 1758
2	Indian Spot Billed Duck *Anas poecilorhyncha,* J.R. Forster, 1781
3	Knob Billed Duck *Sarkidiornis melanotos* (Pennant, 1769)
4	Ruddy Shelduck *Tadorna ferruginea* (Pallas, 1764)
5	Grey Francolin *Francolinus pondicerianus* (J.F. Gmelin, 1789)
6	Peafowl *Pavo cristatus* Linnaeus, 1758
7	Red Junglefowl*Gallus gallus* (Linnaeus, 1758)
8	Emerald Dove *Chalcophaps indica* (Linnaeus, 1758)
9	Eurasian Collered Dove *Streptopeliadecaocto (*Frivaldszky, 1838)
10	Rock Pigeon *Columba livia* J.F. Gmelin, 1789
11	Spotted Dove *Spilopelia chinensis* (Scopoli, 1786)
12	Yellow Legged Green Pigeon *Treron phoenicopterus*
13	Indian Nightjar *Caprimulgus asiaticus* Latham, 1790
14	Asian Koel *Eudynamys scolopaceus* (Linnaeus, 1758)
15	Common Hawk Cuckoo *Hierococcyx varius* (Vahl, 1797)
16	Pied Cuckoo *Clamatorjacobnus*(Boddaert, 1783)
17	Common Moorhen *Gallinula chloropus* (Linnaeus, 1758)
18	Purple Swamphen*Porphyrioporphyrio*(Linnaeus, 1758)
19	White Breasted Waterhen *Amaurornis phoenicurus* (Pennant, 1769)
20	Sarus Crane *Antigone antigone* (Linnaeus, 1758)
21	Lesser Adjutant *Leptoptilos javanicus* (Horsfield, 1821)
22	Woolly Necked Stork *Ciconia episcopus* (Boddaert, 1783)
23	Cattle Egret *Bubulcus ibis* (Linnaeus, 1758)
24	Indian Pond Heron *Ardeola grayii* (Sykes, 1832)
25	Little Egret *Egretta garzetta* (Linnaeus, 1766)
26	Black Headed Ibis *Threskiornis melanocephalus* (Latham, 1790)
27	Little Cormorant *Microcarbo niger* (Vieillot,1817)
28	Eurasian Thick Knee *Burhinus oedicnemus* (Linnaeus, 1758)
29	Little Ringed Plover *Charadrius dubius* Scopoli, 1786
30	Red Wattled Lapwing *Vanellus indicus (*Boddaert, 1783)
31	Yellow Wattled Lapwing *Vanellus malabaricus* (Boddaert, 1783)
32	Bronze Winged Jacana *Metopidius indicus* (Latham, 1790)
33	Pheasant-tailed Jacana *Hydrophasianus chirurgus* (Scopoli, 1786)
34	Eurasian Curlew *Numenius arquata* (Linnaeus, 1758)
35	Spotted Redshank *Tringa erythropus* (Pallas, 1764)
36	Wood Sandpiper *Tringaglareola* Linnaeus, 1758
37	Barred Buttonquail *Turnix suscitator* (J.F. Gmelin, 1789)
38	Black Shouldered Kite *Elanus caeruleus* (Desfontaines, 1789)
39	Crested Serpent Eagle *Spilornis cheela* (Latham, 1790)
40	Egyptian Vulture *Neophron percnopterus*(Linnaeus, 1758)
41	Indian Vulture *Gyps indicus*(Scopoli, 1786)
42	Shikra *Accipiter badius*(J.F. Gmelin, 1788)
43	Common Barn owl *Tyto alba*(Scopoli, 1769)
44	Indian Scops Owl *Otus bakkamoena* Pennant, 1769
45	Spotted Owlet *Athene brama* (Temminck, 1821)
46	Indian Grey Hornbill *Ocyceros birostris* (Scopoli, 1786)
47	Common Hoopoe *Upupa epops* Linnaeus, 1758
48	Coppersmith Barbet *Psilopogonhaemacephalus* (Statius Muller, 1776)
49	Green Bee Eater *Merops orientalis* Latham, 1801
50	Indian Roller *Coracias benghalensis* (Linnaeus, 1758)
51	Common Kingfisher *Alcedo atthis*(Linnaeus, 1758)
52	Pied Kingfisher *Cerylerudis*(Linnaeus, 1758)
53	Stork Billed Kingfisher *Pelargopsiscapensis*(Linnaeus, 1766)
54	Common Kestrel *Falco tinnunculus*Linnaeus, 1758
55	Plum Headed Parakeet *Psittacula cyanocephala* (Linnaeus, 1766)
56	Rose Ringed Parakeet *Psittaculakremeri*(Scopoli, 1769)
57	Indian Pitta *Pittabrachyura*(Linnaeus, 1766)
58	*Black Headed Cuckoo Shrike Lalage melanoptera*(Rüppell, 1839)
59	Large Cuckoo Shrike *Coracina javensis* (Horsfield, 1821)
60	Eurasian Golden Oriole *Oriolus oriolus*(Linnaeus, 1758)
61	Black Drongo *Dicrurus macrocercus* Vieillot, 1817
62	Greater Racket-Tailed Drongo *Dicrurus paradiseus*(Linnaeus, 1766)
63	Indian Jungle Crow *Corvusmacrorhynchos*Wagler, 1827
64	House Crow *Corvus splendens* Vieillot, 1817
65	Rufous Treepie *Dendrocitta vagabunda* (Latham, 1790)
66	Indian Paradise Flycatcher *Terpsiphone paradisi* (Linnaeus, 1758)
67	Purple Sunbird *Cinnyris asiaticus* (Latham, 1790)
68	Scaly Breasted Munia *Lonchura punctulata*(Linnaeus, 1758)
69	Chestnut Shouldered Petronia *Gymnoris xanthocollis* (E. Burton, 1838)
70	House Sparrow *Passer domesticus* (Linnaeus, 1758)
71	Plain Prinia*Priniainornata*Sykes, 1832
72	Red Vented Bulbul *Pycnonotus cafer* (Linnaeus, 1766)
73	Red Whiskered Bulbul *Pycnonotus jocosus* (Linnaeus, 1758)
74	Oriental White Eye *Zosteorpspalpebrosus*(Temminck, 1824)
75	Jungle Babbler *Turdoides striata* (Dumont, 1823)
76	Brahminy Starling *Sturnia pagodarum*(J.F. Gmelin, 1789)
77	Common Myna *Acridotheres tristis* (Linnaeus, 1766)
78	Bluethroat *Luscinia svecica* (Linnaeus, 1758)
79	Common Stonechat *Saxicola maurus* (Pallas, 1773)
80	Oriental Magpie Robin *Copsychus saularis* (Linnaeus, 1758)
81	Verediter Flycatcher *Eumyiasthalassinus*(Swainsin, 1838)

Diversity Indices

A diversity index is a numerical measure of species diversity in a given community which is based on the species richness (the number of species present) and species abundance (the number of the individual per species), where the higher number of species shows a higher diversity of the area. However, here two kinds of indices, dominance index and information statistic index were used for data measurement. From the identified and recorded avian numbers, these statistics apply to association data, where the number of individuals was tabulated in rows (taxa) and possibly several columns (samples). The present statistics are as follows, for all sample:

- No. of taxa is (S)
- Total no. of individuals is (n)
- Dominance = 1-Simpson index; Ranges from 0 (All the taxa are equally present) to1 (one taxon dominates the community completely).

$$D = \sum_i \left(\frac{ni}{n}\right)^2$$

ni= number of individuals of taxon i.

- **Simpson index 1-D.** Measures- 'evenness' of the community from 0 to 1. Note the confusions in the literature: Dominance and Simpson indices are often interchanged.
- **Shannon index (entropy).** A diversity index is taking into account the number of individuals as well as a number of taxa. Varies from 0 for communities with only a single taxon to high values for communities with many taxa, each with few individuals.

$$H = -\sum_i \frac{ni}{n} ln \frac{ni}{n}$$

- **Brillouin's index :**

$$HB = \frac{\ln (n!) \ln (ni!)}{n}$$

- **Menhinick's richness index** :

$$\frac{S}{\sqrt{n}}$$

- **Margalef's richness index**: (S-1) / ln(n)
- **Berger-Parker dominance**- simply the number of individuals in the dominant taxon relative to n.

Table - 2 : Tabular Compilation of Diversity Indices pertaining to Avian Species recorded at RDVV Campus

	A	Lower	Upper	B	Lower	Upper	C	Lower	Upper
Taxa_S	81	81	81	81	80	81	81	80	81
Individuals	527	527	527	485	485	485	590	590	590
Dominance_D	0.03658	0.0312	0.0422	0.03551	0.02994	0.04104	0.03386	0.02952	0.03955
Simpson_1-D	0.9634	0.9578	0.9688	0.9645	0.9589	0.97	0.9661	0.9604	0.9705
Shannon_H	3.834	3.732	3.902	3.854	3.753	3.924	3.885	3.776	3.936
Evenness_e^H/S	0.5707	0.5158	0.6114	0.5825	0.527	0.6249	0.6008	0.5395	0.6331
Brillouin	3.589	3.495	3.656	3.593	3.501	3.662	3.656	3.556	3.707
Menhinick	3.528	3.528	3.528	3.678	3.633	3.678	3.335	3.294	3.335
Margalef	12.76	12.76	12.76	12.94	12.77	12.94	12.54	12.38	12.54
Equitability_J	0.8724	0.8494	0.8881	0.877	0.8542	0.893	0.8841	0.8595	0.896
Fisher_alpha	26.72	26.72	26.72	27.78	27.28	27.78	25.42	24.97	25.42
Berger-Parker	0.1101	0.08349	0.1328	0.1072	0.08041	0.1299	0.1051	0.07966	0.1271
Chao-1	81.68	82.56	96.83	81.58	82.89	98.5	81.38	81.56	94

RESULTS AND DISCUSSION

On the basis of data collected from 2016 to 2018 conclusions were drawn accordingly which are compiled in the form of following table and results were drawn. As per the data obtained, it can be concluded that the study area is composed of a number of species which are distributed evenly throughout the study area. Also no single species is showing dominance here. For tropical countries, the value of Shannon diversity index can range from 1 to 5. It can be inferred that if the value is within this range, then the area is said to have good diversity. In present study, this value is within this range. Thus, it can be concluded that the area under study has a good diversity of avian fauna.

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EFFECT OF BIOFERTILIZER AND ORGANIC MANURE ON YIELD OF POTATO (SOLANUM TUBEROSUM L.) CV KUFRI BADSHAH.

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ABSTRACT

Organic matter might have provided balanced nutrition and congenial microclimate to grow and yield with full potential..Hormonal influence of Vermi-compost (VC) might have augmented tuber yield..Seed treatment with biofertilizer was at par with VC in respect to yield. Seed treatment might have encouraged better stand establishment. Number of tuber per plant were significantly influenced by the treatments. Lowest Number of tuber (8.11) were recorded in control. Highest number of tuber were recorded (14.24)in T_4 (1/2 FYM 1/2 vermicompost) treatment.

Keywords *: Biofertilizer, organic manure, potato.*

INTRODUCTION

Potato crop is grown under short day conditions in subtropical Indo-Gangetic plains. Uttar Pradesh, West Bengal, Bihar and Gujarat are the leading potato producing states in India . In year 2015 the area and production of potato was 33.7 thousand hectars and 0.23 million tones respectively (Anonymous 2015) .Therefore, there is a need to increase and sustain the productivity of potato, which can be achieved by safeguarding the soil health and improving soil fertility (Swaminathan, 2004) of potato fields. As no single source is capable of supplying the required amount of plant nutrients, integrated use of all sources of plant nutrients is best to supply balanced nutrition to the crop .The integrated nutrient management (INM) systems envisage the use of organic manure along with chemical fertilizers.These sources can reduce the mining of soil nutrients and improve overall soil productivity in terms improved physico-chemical and biological conditions of soil. Higher food production needs higher amount of plant nutrients. Use of inorganic fertilizers has increased considerably to meet the higher nutrient requirements of the present day improved varieties. This creates imbalance in nutrients supply, leading to decline in soil fertility, crop productivity and sustainability. Use of organic matter to meet the nutrients requirement of crops would be an inevitable practice in years to come. A number of diverse organic sources are available for the use in agriculture. Organic manures like farmyard manure, poultry manure and vermin-compost can play important role in potato productivity. The beneficial

effects of organic manure are manifested through increase in soil organic matter, humus and over all soil productivity over the period. Soil organic matter and humus act in several ways, i.e., serves as slow release source of plant nutrients to the crops and increases water holding capacity to maintain the water regime of the soil and act as a buffer against change in soil PH. Biofertilizers like phosphorous solubilizing bacteria (PSB) or Azotobacter may be useful for improving phosphorous and nitrogen nutrition in potato. Also, the application of PSB would help in increasing the efficiency of available phosphorous in the soil by converting unavailable phosphorous into available form. Similarly, nitrogen fixing biofertilizers like azotobacter has the potential to meet a successful availability of nitrogen requirement of potato.

Keeping above points in view a trial on" *Effect of biofertilizer and organic manure on yield of potato tuber (solanum tuberosum L.) cv Kufri Badshah* was conducted to study the effect of organic manure and biofertilizer .

MATERIALS AND METHODS

Field experiment entitled "**Effect of Biofertilizer and organic manure on growth and yield of potato (*Solanum tuberosum* L.) "** was conducted at the Horticulture Farm, Kulbhaskar Ashram post graduate college, Prayagraj, Utter Pradesh during winter season in 2018-19. The details of the procedure adopted for crop raising and criteria used for treatment evaluation during entire course of investigation are described a under

EXPERIMENTAL MATERIAL:

The experiment consists of 8 treatment co**mbinations comprising of organic manures** with and without biofertilizer (viz. NPK liquid consortia Bio). The details are as below.

Table - 1 : Details of treatments used in study.

S.N.	Treatment symb.	Treatment details
1.	T_0	Control unit (Recommonded Doze of Fertilizers=RDF)
2.	T_1	FYM@15 t/ha
3.	T_2	Vermicompost @5 t/ha
4.	T_3	NPK Liquid consortium (Biofertilizer)@150ml/10kg seed treatment
5.	T_4	7.5 tonnes FYM+2.5 tonnes vermicompost /ha.
6.	T_5	7.5 tonnes FYM/ha +75ml NPK liquid consortium (Bio fertilizer) /10kg seed treatment.
7.	T_6	2.5 tonnes vermicompost/ha+75ml NPK Liquid consortium (Bio fertilizer)/10kg seed treatment.
8.	T_7	5 tonnes FYM/ha+1.66 tonnes vermicompost/ha+50ml NPK liquid consortium /10kg seed treatment.

EXPERIMENTAL DETAILS AND LAYOUT:

Design of experiments.

The experiment was laid out in Randomized Block Design with three replications. The treatments were randomly allotted to different plots using random number table of Fisher and Yates (1963).

Table - 2 :

S. N.	Design	:	Randomized Complete Block Design.
1.	Replication	:	Three
2.	Treatment	:	Eight
3.	Total number of plots	:	24
4.	Name of crop	:	Potato (*solanum tuberosum* L.)
5.	Variety	:	Kufri Badshah
6.	Plot size	:	2x1.8=3.6. cm. sq
7.	Row to Row distance	:	60.cm
8.	Plant to plant distance	:	20.cm
9.	Number of rows in each plot	:	3.
10.	Gross area of experimental field	:	18.7x9.2=172.04 sq. m.
11.	Net area of experimental field	:	16x5.4=86.4sq.m.
12.	Number of plants for observation per plot	:	5.
13.	Plot to plot distance	:	30.cm.
14.	Distance between replication	:	1.0m.
15.	Season	:	Winter 2018-19
16.	Date of sowing	:	18-11-2018
17.	Date of harvesting	:	18-03-2019

RESULTS AND DISCUSSION

The results of the field experiment were carried out to study the **Effect of biofertilizer and organic manure on yield of potato(*Solanum* tuberosum L.)** conducted at Horticulture Farm, Kulbhaskar Ashram Post Graduate College, Pryagraj. Utter Pradesh are presented here-

The finding of the investigation entitled Effect of biofertilizer and organic manure on yield of potato (*Solanum tuberosum* L.)" has been described and explained with support of relevant research work published by earlier workers in the subject as follows.

The use of organic manure in soil not only increase the fertility and moisture holding capacity in soil ,but also play an important role in soil water conservation by their binding and aggregation properties .More over they are helpful in balancing nutrient availability to growing plants and boost the production and quality of crops.

Health problems, quality consciousness and degradation of natural resources in the environment have thrown new challenge .Due to these burning problems organic farming and use of biofertilizer is gaining lot of importance towards achieving sustainability in crop production.

Several attempts have been made in part to increase the yield potential of tuber crops but they are concerned with use of chemical fertilizers.

Unfortunately not only the productivity potential is low but the quality is also deteriorating. Hence it is time to think not only of increasing the production but also to improve the quality. In any crop production program, the main factor to be considered for better returns is lower the cost of production without compromising on yield of the crop . The results obtained are discussed have under.

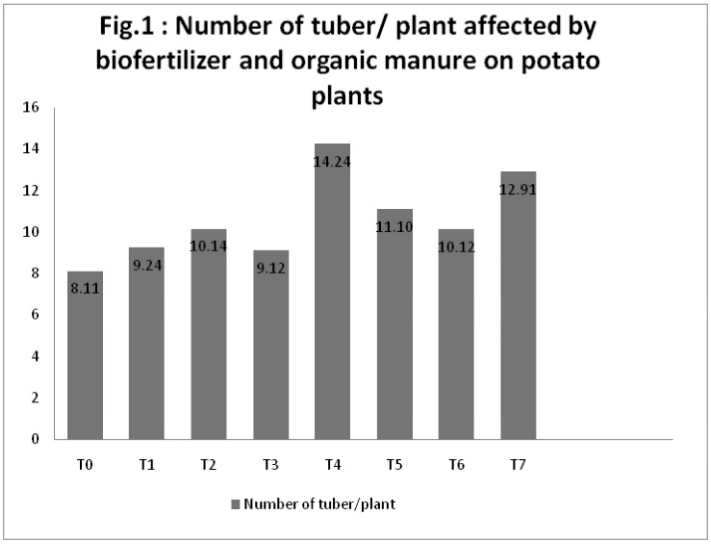
Number of tuber per plant :-

Data clearly shows that number of tuber per plant significantly influenced by the treatments.

Lowest number of tuber (8.11/plant) were recorded in control ,while the highest number of tuber were recorded (14.24/plant)in T_4 (1/2FYM1/2 vermicompost) treatment .All the treatments were better over control.Single application of vermicompost was better over FYM.Second treatment was not as good as FYM and vermicompost treatment. FYM and vermicompost when applied togather reducing half dose the number of tuber was increased .Reduction of FYM &vermicompost to the 1/3rd level reduced number of tuber (12.91/plant).Organic matter was beneficial to increase the number of tuber per plant .Organic matter was found to increase microflora level of the soil which increase the mineralization of nutrients. These nutrients become easily available to the plant. Vigour of the plant was directly related to the number of tuber per plant. Findings ***of Ghosh and Das (1998) in potato,Shambavi and Sharma(2011)in potato; Jaipul et al.(2011); Chaudhary et al.(2010) ; Rex (1990)in potato ; Aityeh et al.(2000)and Kumar et al. (2013).***

Table - 3 : Effect of biofertilizer and organic manure on number of tuber per plant of potato:

Treatment Symbol	*Treatment Details*	*Number of tuber per plant*
T_0	Control Unit(Recommended Dose of Fertilizer =RDF)	8.11
T_1	FYM@ 15t/ha	9.24
T_2	Vermicompost @5t/ha	10.14
T_3	NPK liquid consortium (Biofertilizer) @150ml /10kg seed treatment	9.12
T_4	7.5 tonnes FYM+2.5tonnes vermicompost /ha	14.24
T_5	7.5tonnes FYM/ha+75ml NPK liquid consortium (Biofertilizer) /10kg seed treatment .	11.10
T_6	2.5tonnes vermicompost /ha+75ml NPK liquid consortium (Biofertilizer)/10kg seed treatment	10.12
T_7	5 tonnes FYM/ha+1.66 tonnes vermicompost/ha+50ml NPK liquid consortium/10kg seed treatment	12.91
	SEm±	***2.33***
	C. D. at 5% level	***4.71***



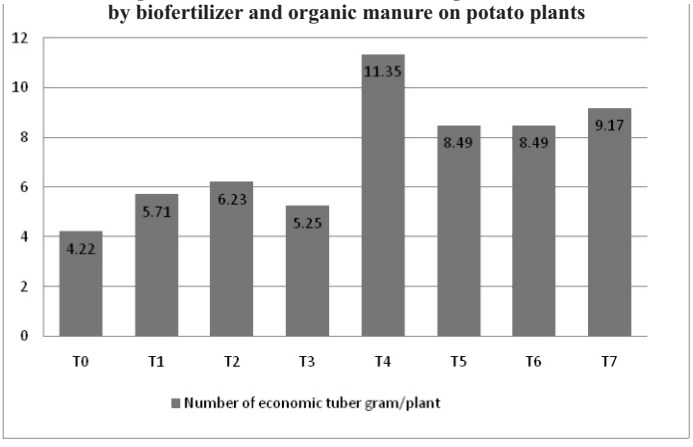
***Number of economic tuber per plant*:**

Data clearly shows that number of economic tuber per plant significantly influenced by the treatments. Lowest number of economic tuber (4.22/plant) were recorded in control ,whilethe highest number of economic tuber were recorded (11.35/plant)in T_4 (1/2FYM1/2vermicompost) treatment .All the treatments were better over control.Single application of vermicompost was better over FYM.Second treatment was not as good as FYM and vermicompost treatment. FYM and vermicompost when applied togather reducing half dose, the number of economic tuber were increased .Reduction of FYM &vermicompost to the 1/3rd level reduced number of economic tuber (8.49/plant). Organic matter was beneficial to increase the number of economic tuber per plant .Organic matter was found to increase microflora level of the soil which increase the mineralization of nutrients. These nutrients become easily available to the plant.Vigour of the plant was directly related to the number of tuber per plant. Findings of ***Naryan et al.(2013)in potato ,Verma et al.(2010)in potato, Verma et al.(2011) in potato; Hussain et al. (2007), Kumar et al, (2005).***

Table - 4 : Effect of biofertilizer and organic manure on number economic tuber per plant of potato

Treatment Symbol	*Treatment Details*	*Number of economic tuber per plant*
T_0	Control Unit(Recommended Dose of Fertilizer =RDF)	4.22
T_1	FYM@ 15t/ha	5.71
T_2	Vermicompost @5t/ha	6.23
T_3	NPK liquid consortium (Biofertilizer) @150ml/ 10kg seed treatment	5.25
T_4	7.5 tonnes FYM+2.5tonnes vermicompost /ha	11.35
T_5	7.5tonnes FYM/ha+75ml NPK liquid consortium (Biofertilizer) /10kg seed treatment .	8.49
T_6	2.5tonnes vermicompost /ha+75ml NPK liquid consortium (Biofertilizer)/10kg seed treatment	9.71
T_7	5 tonnes FYM/ha+1.66 tonnes vermicompost/ha+50ml NPK liquid consortium/10kg seed treatment	8.49
	SEm±	***1.23***
	C. D. at 5% level	***2.14***

Fig. - 2 : Number of economic tuber/plant affected by biofertilizer and organic manure on potato plants



CONCLUSION

The organic matter and Biofertilizer have found to have synergistic effect on tuber number and economic tuber per plant The farmer are advised to use FYM and vermicompost to augment tuber yield of potato.

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TRUE BUGS (INSECTA: HEMIPTERA) OF PRAYAGRAJ, UTTAR PRADESH, INDIA

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ABSTRACT

The study yielded the identification of 31 species belonging to 11 families of the order Hemiptera and all these species are reported first time from Prayagraj and nearby district. The distribution of the species in the locality is also provided.

Keywords : *Prayagraj and nearby district, eleven, new records.*

INTRODUCTION

Hemiptera is big diverse group of true bugs. Hemiptera found worldwide, consisting about 184000-193000 species (Hodkinson & Casson, 1991). A detailed account of Hemiptera fauna of north India had been done by Distant (1902, 1904 & 1906). Earlier no detailed study has been done in this area. Some study carried out by various authors in very scattered from, this study will enhance the bug as well as ento fauna of Prayagraj District and its surrounding area.

MATERIALS AND METHODS

During the survey of the Prayagraj and nearby district altogether 66 bugs were collected from various localities of the Prayagraj and nearby district *viz*. Ariculture University of Prayagraj, Gangetic and Yamuna planes of Prayagraj, Jhusi, Kausambi district, Naini, etc. by hand picking, net trap and light tarp methods. The specimens were shorted out and bugs were pinned and dried and identified with the help of literature available.

RESULS AND DISCUSSION

List of Hemiptera studied from Prayagraj and nearby district.

SYSTEMATIC ACCOUNT

ORDER : HEMIPTERA

SUBORDER : AUCHENORRHYNCHA

INFRAORDER : CICADOMORPHA

SUPERFAMILY : CERCOPOIDEA

FAMILY : CERCOPIDAE

1. *Callitettix versicolor* (Fabricius), 1794

   1794. *Callitettix versicolor* Fabricius, *Ent. Syst*. IV: 50.

   1908. *Callitettix versicolor,* Distant, *Fauna Br. India,* IV: 113.

   2004. *Callitettix versicolor*: Biswas *et al*., *State Fauna Series 10: Fauna of Manipur:* 244

   Distribution: India; Uttar Pradesh, Madhya Pradesh, Bihar, Kashmir, Maharashtra, Sikkim, Tamil Nadu and West Bengal. *Elsewhere*: Burma, China and South Eastern Asia.

SUBORDER : HETEROPTERODEA
INFRAORDER : CIMICOMORPHA
SUPERFAMILY : CIMICOIDEA
FAMILY : REDUVIIDAE

2. *Tribelocephala indica* (Walker) 1873
   1873. *Tribelocephala indica* Walker, *Cat. Het.* , VIII: 20.
   1902. *Tribelocephala indica* Distant, *Fauna Br. India, Heteroptera*, II: 220.
   Distribution : Uttar Pradesh, Madhya Pradesh, Maharashtra, Chhattisgarh, Assam and West Bengal.
3. *Ectrychotes dispar* Reuter, 1881
   1881. *Ectrychotes dispar* Reuter, *Act. Soc. Sc. Fenn.,* XII: 304.
   1902. *Ectrychotes dispar*: Distant, *Fauna Br. India,* II: 315.
   Distribution: India; Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Maharashtra and West Bengal.
4. *Polididus armatissimus* Stal, 1859
   1859. *Polididus armatissimus* Stal, *Ofv. Vet.-Ak. Forh*,: 376.
   1902. *Polididus armatissimus,* Distant, *Fauna Br. India,* II: 386 - 387.
   2007. *Polididus armatissimus:* Biswas and Bal, *Fauna of Andhra Pradesh: State Fauna Series* V*:*336
   Distribution: India; Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Maharashtra and West Bengal. *Elsewhere*: China, Japan, Myanmar, Philippines and Sri Lanka.
5. *Onchocephalus schioedtei* Reuter 1883*
   1830**.***Onchocephalus schioedtei* Reuter *Act. Soc. Sc. Fenn*. XII:702
   1902. *Onchocephalus schioedtei* : Distant, *Fauna Br. India, Heteroptera*, II : 232.
   Distribution: India; Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Maharashtra and West Bengal.
6. *Prostemma carduelis,* Dohrn 1858
   1858. *Prostemma carduelis Dohrn, Stett. Ent. Zeit*.,: 229.
   1902. *Prostemma carduelis* Dohrn, Distant, *Fauna Br. India, Heteroptera*, II: 223.
   Distribution: Throughout India. *Elsewhere:* Sri Lanka and Myanmar.
7. *Ectomocoris cordiger* Stal
   1855. *Ectomocoris cordiger* Stal, *Ofv. Vet.-Ak. Forh*.,256
   1995. *Ectomocoris cordiger* Stal, Biswas et al.: *Fauna of West Bengal: State Fauna Series* 3(V):400
   Distribution: Uttar Pradesh, Madhya Pradesh, Assam, Meghalaya, West Bengal and Uttarakhand. *Elsewhere:* Sri Lanka and Myanmar.

INFRAORDER : PENTATOMORPHA
SUPERFAMILY : LYGAEOIDEA
FAMILY : LYGAEIDAE

8. *Spilostethus hospes* (Fabricius, 1794)
   1794. *Lygaeus hospes* Fabricius, *Ent. Syst*., IV:150
   2009. *Spilostethus hospes*, Ghosh, *Handbook on Hemiptera pest in India*: 371. Zoological survey of India.
   Distribution: India: Uttar Pradesh, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu and West Bengal. *Elsewhere*: Australia, China, Malayan Archipelago, Pakistan, Sri Lanka and New Caledonia,
9. *Spilostethus pandurus militaris* (Fabricius, 1775)
   1775. *Cimex militaris* Fabricius *Syst. Ent*.: 717
   1988. *Spilostethus pandurus militaris*: Mukhopadhaya, *Rec. Zool. Surv. India, Occ. Paper No.* **107***:*15
   Distribution: India: Uttar Pradesh, Madhya Pradesh, Karnataka, Maharashtra, Orissa, Punjab, Uttar Pradesh, and West Bengal. *Elsewhere*: Australia, Pakistan.
10. *Metochus uniguttattus* (Thunberg, 1822)

1822. *Dieuches uniguttattus* Thunberg, *Hem. Rostr. cap*., 4: 6.

1902. *Dieuches uniguttattus* Distant, *Fauna Br. India, Heteroptera,* II: 82-83.

1988. *Metochus uniguttatus*: Mukhopadhaya, *Rec. Zool. Surv. India, Occ. Paper No. 107:*56.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Assam and Karnataka. *Elsewhere:* Myanmar, Sri Lanka.

SUPERFAMILY: PYRRHOCOROIDEA

FAMILY: PHYRRHOCORIDAE

11. *Physopelta gutta* Burmeister, 1834

1902. *Physopelta gutta*: Distant *Fauna Brit India* II: 97

1927. *Physopelta gutta*: Tacuber, Konowia VI: 174

Distribution: India: Uttar Pradesh, Madhya Pradesh, Assam and West Bengal. *Elsewhere*: Australia, Borneo, Sri Lanka, China, Japan and Philippines.

12. *Dysdercus koenigii* (Fabricius, 1775)

1775. *Dysdercus cingulatus* Fabricius, *Syst. Ent*. : 719.

1902. *Dysdercus cingulatus,* Distant, *Fauna Br. India,* II: 118.

1914. *Dysdercus koenigii,* Bergroth, *Ent. Mitt*.III : 335.

1995. *Dysdercus koenigii,* Sen *et al*. *Fauna of West Bengal: State Fauna Series* 3(V):

Distribution: India: Uttar Pradesh, Assam, Karnataka, Sikkim and West Bengal *Elsewhere*: Pakistan and Sri Lanka.

13. *Antilochus coqueberti,* (Fabricius,1803)

1803. *Antilochus coqueberti,*(Fabricius), *Syst. Rhyng*,: 222.

1902. *Antilochus coqueberti,* Fabricius, *Fauna Br. India,* II: 101.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Kashmir, Assam, West Bengal and Andhra Pradesh. *Elsewhere*: Sri Lanka and Myanmar.

SUPERFAMILY : COREOIDEA

FAMILY: COREIDAE

14. *Anoplocnemis phasiana* Fabricius, 1781

1781. *Anoplocnemis phasiana* Fabricius, *Spec. Ins*.: 361.

1902. *Anoplocnemis phasiana* Distant, *Fauna Br. India*, *Rhynchota* I: 346.

Distribution: India; Uttar Pradesh, Madhya Pradesh, Sikkim, Orissa, Maharashtra, Karnataka, Kerala. *Elsewhere*; Sri Lanka.

15. *Elasmomia granulipes* Westwood, 1842

1842. *Elasmomia granulipes* Westwood *in Hope Cat*. II: 11

1904. *Elasmomia granulipes,* Distant, *Fauna Br. India, Heteroptera*, I : 339

Distribution: India; Uttar Pradesh, Madhya Pradesh Chhattisgarh and Sikkim.

16. *Serinetha abdominalis* Fabricius, 1803

1803. *Serinetha abdominalis* Fabricius *Syst. Rhyng*.: 226

1904. *Serinetha abdominalis* Distant, *Fauna Br. India*, *Rhynchota* I: 419.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Maharashtra, Assam and West Bengal. *Elsewhere:* Myanmar and Sri Lanka.

FAMILY: ALYDIDAE

17. *Riptortus fuscus* (Fabricius), 1798

1798. *Riptortus fuscus* Fabricius*, Ent. Syst. suppl*.: 539.

1902. *Riptortus fuscus,* Distant, *Fauna Br. India,*I:414.

1994. *Riptortus fuscus,* Basu and Mitra, *State Fauna Series 3: Fauna of West Bengal* V: 451.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Maharashtra, Karnataka and West Bengal. *Elsewhere:* Myanmar, Sri Lanka.

18. *Leptocorisa varicornis* Fabricius, 1803

1803. *Leptocorisa varicornis* Fabricius, *Syst. Rhyng*. : 260.

1902. *Leptocorisa varicornis* Distant, *Fauna Br. India* I: 409.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Assam, Kerala, Meghalaya, Nagaland, Sikkim and West Bengal. *Elsewhere*: China, Myanmar.

SUPERFAMILY : PENTATOMOIDEA

FAMILY : PENTATOMIDAE

19. *Antestia cruciata* (Fabricius), 1775

1775. *Antestia cruciata* Fabricius, *Syst. Ent*. : 714

1902. *Antestia cruciata,* Distant, *Fauna Br. India,*I: 185.

1995. *Antestia cruciata*, Ghosh *et al*., *State Fauna Series, 3: Fauna of West Bengal* V: 497.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Maharashtra, Sikkim, Tamil Nadu and West Bengal. *Elsewhere*: Myanmar and Sri Lanka.

20. *Canthecona furcellata* Wolff, 1851

1851. *Canthecona furcellata* Wolf*, List. Hem*. I: 91.

1904. *Canthecona furcellata* Distant, *Fauna. Brit. India,* I: 248.

2010.*Canthecona furcellata*: Biswas and Bal, *Fauna of Uttarakhand: State Fauna Series*XVIII: 237.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Jharkhand, Maharashtra, Tamil Nadu and West Bengal. *Elsewhere*: Sri Lanka, Myanmar.

21. *Erthesina fullo* (Thunberg), 1783

1783. *Cimex fullo* Thunberg, *Nov.Ins. Spec*.II:42

1904. *Erthesina fullo,* Distant, *Fauna Brit.India*, I:177

1998. *Erthesina fullo,* Chakroborty, S.P. & Ghosh,L.K., *State Fauna Series* 4: *Fauna of Meghalaya, part*-IV:403

Distribution: India: Uttar Pradesh, Madhya Pradesh, Andaman Islands, Andhra Pradesh, Assam, Kerala and West Bengal. *Elsewhere:* Bangladesh, China, Japan and Sri Lanka.

22. *Halys dentatus* Fabricius, 1775

1775. *Halys dentatus* Fabricius, *Syst. Ent.*:702.

1904. *Halys dentatus* Fabricius, *Fauna Br. India,*I: 119.

2010. *Halys dentatus*, Biswas and Bal, *Fauna of Uttarakhand: State Fauna Series* XVIII: 232.

Distribution: India; Uttar Pradesh, Chhattisgarh, Madhya Pradesh, Assam, Maharashtra, Sikkim and West Bengal. *Elsewhere*: Sri Lanka.

23. *Nezara viridula* (Linnaeus), 1758

1758. *Nezara viridula* Linnaeus, *Syst. Nat. ed.* X: 444.

1904. *Nezara viridula* Distant, *Fauna Br. India,*I: 220.

2010. *Nezara viridula:* Biswas and Bal, *Fauna of Uttarakhand: State Fauna Series* 18: 236.

Distribution: Throughout India.

24. *Plautia crossota* (Fabrricius, 1787**)**

1787. *Plautia fimbriata* Fabricius, *Mant. Ins*. 295

1904. *Plautia fimbriata,* Distant, *Fauna Br .India*, I:191

1989. *Plautia fimbriata* Ghosh, Biswas, Chakaraborty and Sen, *Fauna of Orissa*: *State Fauna Series* I: 205.

2002. *Plautia crossota*: Rider *et al., Zoosyst Rossica,* 2: 144

Distribution: India: Uttar Pradesh, Madhya Pradesh, Assam, Maharashtra, Nagaland, Orissa, Sikkim, Tamil Nadu and West Bengal.

25. *Eusarcocris ventralis* (Westwood, 1837)

1837. *Pentatoma ventralis* Westwood, *in Hope cat*., I:30

1904. *Eusarcocris ventralis* Distant, *Fauna Br .India*, I:167

2010. *Eusarcocris ventralis* Biswas and Bal, *Fauna of Uttarakhand: State Fauna Series* 18: 234.

Distribution: Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Karnataka, Maharashtra, Bihar and Uttarakhand. *Elsewhere*: Myanmar and

Malaya.

26. *Eusarcocris montivagus,* Distant, 1904

1904. *Eusarcocris montivagus,* Distant, *Fauna Br .India*, I:166

Distribution: Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Nagaland, West Bengal and Assam.

FAMILY : CYDNIDAE

27. *Aethus indicus* (Westwood, 1837)

1803. *Cydnus indicus* Westwood, *Syst. Rhyn.* : 184.

1994. *Cydnus indicus* Chakraborty et al., *State Fauna Series*, *Fauna of West Bengal,* V: 489.

2007. *Aethus indicus* Lis & Lis. Peltoxys sataranus, a new burrower bug species from India and a new records of some other heteropterans from Maharashtra State (Hemiptera: Heteroptera) *Genus. Wroclaw.*18 (2):209-214.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Maharashtra and West Bengal. *Elsewhere*: Australia, South Africa and Southeast Asia.

FAMILY : ASOPINIDAE

28. *Asopus malabaricus* (Fabricius) 1775

1775. *Asopus malabaricus* Fabricius, *Syst. Ent*. ,: 718.

1904. *Asopus malabaricus,* Distant, *Fauna Br.India, Heteroptera,* I: 255

Distribution: Uttar Pradesh, Assam, Madhya Pradesh, Maharashtra, Karnataka and West Bengal. *Elsewhere*: China, Myanmar and Sri Lanka

FAMILY : DINIDORIDAE

29. *Coridius ianus* (Fabricius), 1775

1775. *Aspongopus janus* Fabricius, *Syst. Ent.*: 714.

1902. *Aspongopus janus* Distant, *Fauna Br. India,* I: 281.

1992. *Coridius ianus*: Lis, *Ann. Upper Silesian Mus. Ent.,* III: 38.

Distribution: India: Uttar Pradesh, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu and West Bengal.

Elsewhere: Myanmar and Sri Lanka.

30. *Cyclopelta siccifolia* Westwood, 1837

1837.*Cyclopelta siccifolia* Westwood in *Hope cat.* I: 26

1854. *Cyclopelta tartarea,* Stal, vet.-*Ak.Eorh,*: 234

Distribution: Uttar Pradesh, Andhra Pradesh, Assam, Madhya Pradesh, Maharashtra, Sikkim, West Bengal, *Elsewhere:* Myanmar and Sri Lanka.

FAMILY: SCUTELLERIDAE

31. *Poecilocoris interruptus* (Westwood, 1837)

1837. *Tectocoris interruptus* Westwood., in *Hope Cat*., I:14

1904. *Poecilocoris interruptus,* Distant *Fauna Brit.India*,I:48

Distribution: Uttar Pradesh, Himachal Pradesh, Madhya Pradesh, Nagaland, Sikkim and Uttarakhand.

RESULS AND DISUCCION

Bugs mainly occur as a pest on various plants. Present paper deals with study of 29 genera belonging to 31 species of order Hemiptera. This study will enhance the True bug fauna of Prayagraj District.

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STANDARDIZATION OF DIFFERENT RECIPES ON SENSORY CHARACTERISTICS OF BER PICKLE DURING STORAGE

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ABSTRACT

Ber fruits are seasonal and highly perishable; it cannot be stored for longer period at ambient condition and cannot be transported to distant places. Present investigation was conducted at Rainfed Research Sub-Station for Sub-tropical Fruits, Raya, SKUAST-Jammu. The study was aimed at the formulation of pickle product. The ber pickle was prepared by three different recipes *i.e* recipe I, recipe II and recipe III. The pickle was stored for three months at room temperature. The developed pickle was sensory evaluated by judges where using nine-point hedonic scale. No fungal growth was observed in recipe III during three months of storage. On the basis of overall acceptability score, recipe III recorded the highest score and most acceptable than other two recipes. The storage of the product in room temperature showed that pickle prepared from recipe III remained unchanged even after three months of storage.

Keywords **:** *Ber, sensory evaluation, pickle, storage*

INTRODUCTION

The Jujube or the Ber (*Zizyphus mauritiana*Lamk.) is a very old fruit of India and China. Ber belongs to the genus Zizyphus of the family Rhamnaceae. Zizyphusjujuba and Zizyphusmaurtiana are the most important cultivated species of ber. Z. jujuba is deciduous, has glabrous leaves and is known as Chinese jujube or Chinese date whereas, Z. mauritiana is evergreen, has pubescent leaves and is commercially the most important in India. This is called as Ber or Indian jujube (Yamdagni, 1985). Ber can provide food security, due to sustained production of the fruit, irrespective of drought, as the tree is drought and saline tolerant and can grow on poor degraded land (Pareek, 2001).In India ranks first amongst the ber growing countries of the world.Ber popularly known as "Apple of desert" and excels many important fruits like apple and orange in vitamins and mineral content. Its fruit is rich source of vitamin C. The fruit ripens in March-April when practically no other fruits are readily available in the market. Moreover the shelf life of ber fruit is very short as after harvesting, if not handled properly, it becomes over mature within two days at ambient temperature. Therefore developing and standardization of processing techniques will help to stabilize the price leveland utilize the surplus produce (Gupta and Kaul, 2013). Ber fruits are very nutritious and rich in vitamin C, A and B complex.

Ber fruits can be within the reach of the poor people and hence known as poor man's fruit (Gupta *et al*. 2012). Pickling is one of the oldest known methods of preserving foods, and a long-time favourite among home canners (Kumar, 2015). It doubles the taste of food, adds spicy flavour and arepalatable to eat. Indian pickling process is different from other countries mainly due to additional spice mixture added to them (Horwitz, 2000).Pickle is a good appetizer consumed by all age of people which contain large amount of lactobacilli bacteria which are important for the digestion of grains and vegetables which have usual beneficial probiotics properties used by the body (Shahzor *et al.*, 2015). For pickling proper concentration of salt is very important for better shelf life and also to reduce the infestation of mould, yeast and bacteria. If salt concentration is less, the product gets slimy, soft and holds lots of water. Therefore the average salt concentration should not be less than 5.3% (Rajablou*et al*., 2012). Sensory attribute is one of the important factors which govern the consumers' acceptance of food products and their purchase intent. The overall quality of any food product is related to several sensory attribute like appearance, texture and flavour (Devi, 2019).Proper postharvest technology for prolonging shelf life is, therefore, necessary. Besides, alternate ways of using jackfruits in no-seasons plays significant roles in reducing post-harvest losses. Among them, processing is important one. It adds diversified and attractive food items in dietary menu as well as contributes to generation of income and employment. The objectives of this research work are to standardize the bestrecipe of ber pickle through sensory evaluation.

MATERIALS AND METHODS

The lab study was conducted at Rainfed Research Sub-Station for Sub-Tropical Fruits (RRSS), Raya, SKUAST-J, Samba, Jammu and Kashmir UT. The study was conducted under adhoc Research Project entitled, "Exploitation of under-utilized fruits of *kandi* areas of Jammu region through value addition for human resource development" funded by SERB-DST, New Delhi, GOI.For the standardization of ber pickle, the matured fruits of green stage were selected. Ber fruit was procured from RRSS, Raya which were used for making pickle. Select fresh, greenber wash thoroughly with tap water to remove dust and dirt. Blanch it for 2 min and drain water properly. For making ber pickle, mustard oil was heated and all the spices mixed, fried for few seconds, blanched ber was added and fry for 3-5 minin low flame till it blended properly. Then salt and remaining oil were added. Then, the fried ber pickle was cooled, filled in to sterilized glass bottles and sealed airtight. The three different recipes of ber pickle are given in Table 1.The ber pickle was stored for a period of three months. Stored pickle was drawn at monthly intervals for visual observation of fungal growth and sensory evaluation up to 3 months.

Table - 1 : Variation in addition of spices for pickle preparation of 1 kg of ber

Ingredients	Recipe I Ber (Raw)	Recipe II Ber (Ripe)	Recipe III Ber (Raw)
Fennel powder	50 g	50 g	50 g
Mustard seeds	50 g	50 g	50 g
Coriander powder	20 g	20 g	20 g
Red chilli powder	20 g	20 g	20 g
Turmeric powder	20 g	20 g	20 g
Salt	50 g	50 g	50 g
Mustard oil	50 ml	250 ml	250 ml

RESULTS AND DISCUSSION

Visual observation of fungus growth developed in ber pickle

The fungal growth developed in ber pickle at different storage periods was examined through visual observation. Details of the observation are given in Table 2. Up to 1 months of storage, no fungal growth was observed. During 2nd monthof storage, a slight fungal growth was observed in recipe I due to low concentration of mustard oil. Whitish fungal growth was observed on surface of the pickle. They may come from spices, other ingredients, from the air or from lid of the jar. At 3rd month of storage,recipe I showed excessive growth and recipe II showed slight growth, there was no fungal appearance on the surface of the pickle in recipe III duringthreemonths of storage. The covering of oil as well as proper fruit stage for preparing pickle helped to prevent microbial contamination.Shoba and Bharti (2007) reported that the bacterial counts were less in the fresh pickle compared to stored sample. Similar findings have been also reported by Devi, 2019.

Sensory performance of ber pickle

The change in colour, flavour, texture and taste of the product was observed at a regular interval of 1 month up to 3 months of storage. The processed ber pickles were in good condition up to onemonths. In 2nd month of storage change was observed in colour, off flavour was observed in flavour, soft in texture and good in taste was observed in recipe I. This may be due to lack of proper concentration of mustard oil. During 3rd month of storage, maximum changes were observed in recipe I and II, however no changes were observed in recipe III due to right concentration of mustard oilwhich might have helped to extend the shelf life (Table 3). Devi (2019) also reported similar results for brinjal pickle during storage period.

Table - 2 : Visual observation of fungus growth developed in ber pickle at different storage period

Storage period (months)	Recipe	Fungal growth
0	I	No growth
	II	No growth
	III	No growth
1	I	No growth
	II	No growth
	III	No growth
2	I	Slight growth
	II	No growth
	III	No growth
3	I	Excessive growth
	II	Slight growth
	III	No growth

Table - 3 : Effect of recipe and storage period on sensory performance of ber pickle

Months	Recipe	Colour	Flavour	Texture	Taste
0	I	No change	No off flavour	Firm	Very good
	II	No Change	No off flavour	Firm	Very Good
	III	No change	No off flavour	Firm	Very Good
1	I	No change	No off flavour	Firm	Very Good
	II	No change	No off flavour	Firm	Very Good
	III	No change	No off flavour	Firm	Very Good
2	I	Change	off flavour	Soft	Good
	II	No change	No off flavour	Firm	Very Good
	III	No change	No off flavour	Firm	Very Good
3	I	Excessive change	Excessive off flavour	Excessive soft	Fair
	II	Slight Change	off flavour	Soft	Good
	III	No change	No off flavour	Firm	Very Good

Table - 4 : Effect of recipe and storage period of mean overall acceptability score on ber pickle

Months	Recipe	Overall acceptability
0	I	7.5
	II	8.0
	III	8.5
1	I	7.3
	II	7.9
	III	8.2
2	I	7.1
	II	7.6
	III	8.1
3	I	6.9
	II	7.4
	III	8.0

The consumer's acceptability of processed ber pickle was evaluated by a taste testing panel. The hedonic rating test was used to determine the acceptability of pickle. The scale was arranged such that 9 = like extremely, 8 = like very much, 7 = like moderately, 6 = like slightly, 5 = neither like or dislike, 4 = Dislike slightly, 3 = Dislike moderately, 2 = Dislike very much, 1 = Dislike extremely. The mean score of performance of ber pickle are presented in Table 4. From the table 4, it was

observed that recipe III secured the highest score *i.e*8.5, 8.2, 8.1 and 8.0and the lowest score was 7.5, 7.3, 7.1 and 6.9 during initial to three months of storage.

CONCLUSION

From the overall observations of the experiment it was concluded that recipe III was rated the best with highest sensory performance like colour, flavour, texture taste. On the basis of overall acceptability, it was found that recipe III secured highest score during three months of storage.

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COCCIDIOSIS IN GOATS AND PREVENTION IN AN ORGANIZED SHUATS GOAT FARM

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ABSTRACT

Coccidiosis is contagious disease caused by protozoan *Eimeria spp*., transmitted from animal to animal by faecal-oral rout. Two female Goat died with the history of profuse diarrhoea. A loss of body weight and symptoms like bloody diarrhea, loss of appetite and emaciated was observed in other five kids. Fecal sample from the two dead Goat and live ten Goat revealed that the kids were severely affected with coccidiosis. The faecal histopathological examination observed the presence of coccidian oocysts. Histopathological examination of intestine exhibited the loss of villi and sloughing, and presence of occidian oocysts along with inflammatory cells. The animals in the farm were dewormed by (Oxyclosanid) and the kids were segregated. The animals were treated with Biotrim Inj (Sulphadiazine 400 mg + Trimethoprim 80 mg) intramuscularly along with vitamin and mineral supplements for seven days. Strict hygienic measures like scrubbing and washing the floors by phenol, equipment and disinfection of the premises by lime/potassium per magnet were followed. Uneventful recovery of kids and significantly gain in weight after the treatment was noted. Regular cleaning and disinfection of the sheds, hygienic practices in feed and water supply, reduction in the density of stock and isolation of the carrier animals reduced the exposure of kids to coccidian oocysts.

Keywords *: Goat, coccidiosis, prevention.*

INTRODUCTION

Coccidiosis is a gastrointestinal disease of farm animals. It is caused by *Eimeria spp,* also called *Coccidia spp,* and like *E. arloingi, E. christenseni,* and *E. ovinoidalis,* is highly pathogenic in kids. *Eimeria* are protozoa, a unicellular microorganism naturally found in the soil. *Coccidia* are host-specific, which means that *Coccidia* of cattle and chicken are specific to these species and do not cause disease in goats or vice versa. However, *Coccidia* of goats can affect sheep. There are numerous species of *Coccidia* that are naturally found in the goat intestine. Goats are born without *Coccidia* in the intestine. The infection occurs by ingesting the pathogenic sporulated oocysts (sporulated is a form of resistance of the *Coccidia*). Oocysts can be found in the water or in feed supplies contaminated with feces. Once

ingested, oocysts penetrate the cells lining the intestine where they go through several stages of development and cause inflammation and destruction of intestinal cells.

SIGNS AND SYMPTOM OF COCCIDIOSIS

Sheep and Goat are most susceptible to infection between 1 and 6 months of age, but most clinical disease is seen in lambs and kids between 4 and 8 weeks of age. There is subclinical and clinical forms coccidiosis. Subclinical infection can cause depressed appetite as well as decreased feed efficiency from gut damage, which leads to poor growth rates and weight gains.

The following clinical signs may be associated with clinical coccidiosis:

- Diarrhea
- Anorexia
- Depression
- Weakness
- Abdominal pain
- Dehydration
- Pale mucous membranes
- Acute weight loss

Diarrhea is the most common clinical sign, and it may be bloody or mucoid. The severity of disease varies from self-limiting, in which animals recover without treatment, to severe cases, in which animals quickly succumb to the infection and die.

DIAGNOSIS

Diagnosis depends on the herd history and signs of infection The reports for viruses and bacteria came negative, while the parasitological examination revealed the presence of coccidian oocysts in faecal sample under microscope. The parasitological examination was further supported by histopathology. The histopathological examination of intestine showed, loss of micro villi, areas of sloughing, coccidian oocysts along with inflammatory cells involving the entire intestine.

TREATMENT

- Injection Dextrose 10% @-20-50ml/ kg body weight by I/V route would be given 2-3 days.
- Injection Biotrim (Sulphadiazine 400 mg + Trimethoprim 80 mg) I/M : 1 ml/20kg b.w once daily for 3-5 days.
- Injection Flunimeg (Flunixin 50 mg) IM or IV 1-2 ml/45kg b.wt. Once daily for 3-5 days.
- Injection Vitakey 1ml per 30 kg of body weight S/C or I/M for 3 to 5 days.

These treatment was completely successful without any complained.

Fig no. 1 Treat the coccidiosis infected Goat in SHUATS goat farm.

Fig no. 2. Successfully treat the coccidiosis infected goat in SHUATS goat farm.

PREVENTIVE MEASURES

The control of coccidiosis relies on management practices (www.aces.edu/urban):

- Improve hygiene of facilities, pastures, pens, and feeding and) water sources. Avoid moist areas without direct sunlight, such as under feed bunks and near water troughs.
- Avoid crowded pens and pastures.
- Quarantine before introducing new animals to existing herd.
- Minimize weaning stress. If needed, creep feed to adjust the kids to a new diet prior to weaning.
- Predict possible outbreaks during severe weather and post weaning.
- Add coccidiostat to concentrate as a feed additive. Coccidiostat suppresses the full development of the life cycle of the *Coccidia* and allows immunity to develop. Monensin acts as a coccidiostat and can enhance production performance.

CONCLUSION

Coccidiosis is an important parasitic disease of ruminant livestock. Control of coccidiosis in cattle, sheep, and goats is based on sound management, the use of preventive medications, and treatment of clinical cases as necessary.

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AVIAN FAUNAL DIVERSITY OF RIVER NARMADA BASIN AT JABALPUR DISTRICT OF MADHYA PRADESH

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ABSTRACT

The present study was done alongside river Narmada Basin in Jabalpur in the state of Madhya Pradesh. The study was conducted at different locations at Jabalpur where this river flows which included Khireinighat, Gwarighat, Tilwaraghat and Bhedaghat. In the present study, a total of 172 avian species have been recorded belonging to different families. Afterwards diversity indices were calculated based on the data collected.

Keywords : *Narmada river, Jabalpur, Birds.*

INTRODUCTION

Narmada river which is also known as Nerbudda or Rewa is a central Indian river along with Krishna and Godavari. Due to its major influences, this river is also called as the lifeline of the state of Madhya Pradesh and Gujrat. It rises from Amarkantak near Anuppur district of Madhya Pradesh and drains into the Gulf of Khambhat into Arabian Sea at Bharuch city of Gujarat. Before that it travels westwards, covering a distance of approximately 1312 kms forming a sort of boundary between Northern and Southern India. Mekulsuta, Reva, Murla, Samodhbhava, Trikuta, Vanmala, Shoukatmala, Purv-Ganga, DakshinGanga, Mahajva, Nandana, Chandana, Gautami, Mahanand and the Narmada or "The Giver ofPleasure". These are just a few of the many names that the river is called by and given.

There are many fables about the origin of the Narmada. The river is also frequently mentioned inthe Ramayana, the Mahabharata and the Puranas.

1. According to one of them, Lord Shiva, the Destroyer of the Universe, meditated so hardthat he started perspiring. Shiva"s sweat accumulated in a tank and started flowing in theform of a river – the Narmada.
2. Another legend has it that two teardrops that fell from the eyes of Lord Brahma, theCreator of the Universe, yielded two rivers – the Narmada and the Son (pronouncedSoan).
3. Legends also say that for Lord Shiva, the Hindu God, the river is especially sacred onaccount of its origin, and it is often called Shankari, i.e., daughter of Shankar (LordShiva).

4. All the pebbles in the river bed are said to take the shape of Lord Shiva's emblem withthe saying, "Narmada Ke Kanker utte Shankar", which means that “pebble stones ofNarmada, geta personified form of Shiva“. These lingam shaped stones called “Banalinga” and are much sought after for daily worship by the Hindus. Adi Shankaramet his guru Govinda Bhagavatpada on the banks of river Narmada.
5. Narmada is also said to have been in love with the Sonbhadra, another river flowing onthe Chota Nagpur Plateau.

The first literary reference relating to the name of the Narmada is in Raghuvamsa where it iscalled – Revall (the flood). In the Matsya Purana it is said that – all sins are purified by bathingseven times in the Yamuna, once in the Ganges, but the simple sight of the Narmada is sufficientto exonerate one's sins once and for all.The Ganges is regarded as sacred only in certain areas but the Narmada is sacred everywhere itflows, as much in a village as in a forest.It is also mentioned in the Rewa Khand of the Skanda Purana, often called the Narmada Purana, it says that the history of the creation of the Narmada started with a devastating flood whichoccurred to end the period of Satya Yuga.

The Narmada was also renowned in the ancient world. Ptolemy, a Greek astronomer andgeographer, wrote regarding this river in the 2nd century AD – “Even the Greeks and theEgyptians of Alexandria had heard all about the sacred river and the religious suicides ofAmarkantak: people who fasted until death, who sacrificed themselves on the banks of theNarmada, or who drowned in its water to free themselves from the cycle of the reincarnation”.

The Narmada basin, edged between Vindya and Satpura ranges, spreads over an area of 98,796 km2 and lies between east longitudes 72 degrees 32' to 81 degrees 45' and north latitudes 21 degrees 20' to 23 degrees 45' lying on the northern boundary of the Deccan Plateau. The basin covers large areas in the states of Madhya Pradesh (82%), Gujarat (12%) Maharashtra (4%) and in Chhattisgarh (2%). In the river course of 1,312 km (815.2 mi) explained above, there are 41 tributaries, out of which 22 are from the Satpura range and the rest on the right bank are from the Vindhya range. The highest point of the Narmada basin is Dhupgarh (1,350 m), near Pachmarhi.

The basin has five well defined physiographic regions. They are:

1. The upper hilly areas covering the districts of Shahdol, Mandla, Durg, Balaghat and Seoni,
2. The upper plains covering the districts of Jabalpur, Narsinghpur, Sagar, Damoh, Chhindwara, Hosangabad, Betul, Raisen and Sehore,
3. The middle plains covering the districts of Khandwa, part of Khargone, Dewas, Indore and Dhar,
4. The lower hilly areas covering part of the west Nimar, Jhabua, Dhulia, Narmada and parts of Vadodara, and
5. The lower plains covering mainly the districts of Narmada, Bharuch, and parts of Vadodara district.

The hill areas are well wooded. The upper, middle and lower grasslands are broad and fertile areas, well suited for agriculture. The Narmada basin mainly consists of black soils. The seaside plains in Gujarat are composed of alluvial clays with a layer of black soils on the surface.The tropic of Cancer crosses the Narmada Basin in the Upper plains area. The climate of thebasin is humid and

tropical, but at some places extremes of heat and cold are often encountered.The four most important seasons are winter, summer, the South west monsoon and postmonsoon.Nearly 90% of this rainfall is received during the five monsoon months from June to Octoberabout 60% is received in the two months of July & August.The rainfall is heavy in the upper hilly area and upper plains of the basin. It gradually decreasestowards the lower plains and the lower hilly areas and again increases towards the coast andsouth western portions of the basin.

Majority of study area is covered with lush green vegetation which houses a large number of floral and faunal diversity. Several species of mammals, reptiles and birds etc are spotted here. The natural forest and grassland have constituted a good habitat for many residential as well as migratory birds.

The faunal diversity of the study area includes many species of mammals, reptiles, insects, butterflies, dragonflies as well as spiders. A broad account of avian diversity in the state of Madhya Pradesh and Chhattisgarh was presented by Chandra and Singh (2004). They reported 517 species belonging to 69 families from the areas. Similarly records of birds from Central Highlands of Madhya Pradesh were reported by Jayapal et al. (2005). In 2008, Ghosh *et al.* published a detailed account of avian fauna from the states of Madhya Pradesh (including Chhattisgarh), reporting altogether 449 species. Talmale *et al.,* in 2012 published an account of 173 bird species from Singhori Wildlife Sanctuary (Raisen District), Madhya Pradesh. Dubey *et al*. (2017) reported 56 avian species from Dumna Nature Reserve. Again 46 species of birds from Gun Carriage Factory Estate were recorded by them in same year. Similarly, 118 species of birds belonging to 45 families were reported by Dubey *et al.* in 2018 from College of Material Management (CMM), Jabalpur. In similar context, 72 avian species belonging to 30 families were recorded by Bhandari *et al.* in 2018 from Ordnance Factory Khamaria (OFK) Estate. The present study was conducted on four ghats of Narmada river in Jabalpur city namely Khireinighat, Gwarighat, Tilwaraghat and Bhedaghat. The data was collected and compiled on daily basis from 2016 to 2019 by the help of point count method. The data collected in the present study, revealed a total of 172 avian species belonging to different families.

Table - 1 : List of Avian faunal Diversity

S. No.	Family	Common Name	Scientific Name	IUCN Status	Local Status
1	Anatidae	Common Teal	*Anas crecca* Linnaeus, 1758	LC	WM
2		Indian Spot Billed Duck	*Anas poecilorhyncha,* J.R. Forster, 1781	LC	R
3		Knob Billed Duck	*Sarkidiornis melanotos* (Pennant, 1769)	LC	R
4		Lesser Whistling Duck	*Dendrocygna javanica* (Horsfield, 1821)	LC	R
5		Northern Pintail	*Anas acuta* Linnaeus, 1758	LC	WM
6		Ruddy Shelduck	*Tadorna ferruginea* (Pallas, 1764)	LC	WM
7		Bar-headed Goose	*Anser indicus* (Latham, 1790)	LC	WM
8	Phasianidae	Grey Francolin	*Francolinus pondicerianus* (J.F. Gmelin, 1789)	LC	R
9		Peafowl	*Pavo cristatus* Linnaeus, 1758	LC	R
10		Red Junglefowl	*Gallus gallus* (Linnaeus, 1758)	LC	R
11	Podicipedidae	Little Grebe	*Tachybaptus ruficollis* (Pallas, 1764)	LC	R
12	Columbidae	Rock Pigeon	*Columba livia* J.F. Gmelin, 1789	LC	R
13		Yellow Legged Green Pigeon	*Treron phoenicopterus*	LC	R

S. No.	Family	Common Name	Scientific Name	IUCN Status	Local Status
14		Emerald dove	*Chalcophaps indica* (Linnaeus, 1758)	LC	R
15		Eurasian Collered Dove	*Streptopelia decaocto (*Frivaldszky, 1838)	LC	R
16		Laughing Dove	*Stigmatopelia senegalensis* (Linnaeus, 1766)	LC	R
17		Spotted Dove	*Spilopelia chinensis* (Scopoli, 1786)	LC	R
18	Pteroclidae	Painted Sandgrouse	*Pterocles indicus* (Gmelin, 1789)	LC	R
19	Caprimulgidae	Common Indian Nightjar	*Caprimulgus asiaticus* Latham, 1790	LC	R
20	Apodidae	Asian Palm Swift	*Cypsiurus balasiensis* (J.E. Gray, 1829)	LC	R
21		Crested Treeswift	*Hemiprocne coronata* (Tickell, 1833)	LC	R
22	Cuculidae	Asian Koel	*Eudynamys scolopaceus* (Linnaeus, 1758)	LC	R
23		Common Hawk Cuckoo	*Hierococcyx varius* (Vahl, 1797)	LC	R
24		Sirkeer Malkoha	*Taccocua leschenaultii* Lesson, 1830	LC	R
25	Rallidae	Common Moorhen	*Gallinula chloropus* (Linnaeus, 1758)	LC	R
26		Purple Swamphen	*Porphyrio porphyrio* (Linnaeus, 1758)	LC	R
27		White Breasted Waterhen	*Amaurornis phoenicurus* (Pennant, 1769)	LC	R
28		Brown Crake	*Amaurornis akool* (Sykes, 1832)	LC	R
29	Ciconiidae	Lesser Adjutant	*Leptoptilos javanicus* (Horsfield, 1821)	VU	WM
30		Woolly Necked Stork	*Ciconia episcopus* (Boddaert, 1783)	VU	R
31		Painted Stork	*Mycteria leucocephala* (Pennant, 1769)	NT	R
32		Black-necked Stork	*Ephippiorhynchus asiaticus* (Latham, 1790)	NT	R
33		Asian Openbill	*Anastomus oscitans* (Boddaert, 1783)	LC	R
34	Ardeidae	Cattle Egret	*Bubulcus ibis* (Linnaeus, 1758)	LC	R
35		Great Egret	*Ardea alba* Linnaeus, 1758	LC	R
36		Intermediate Egret	*Mesophoyx intermedia* Wagler, 1827	LC	R
37		Little Egret	*Egretta garzetta* (Linnaeus, 1766)	LC	R
38		Indian Pond Heron	*Ardeola grayii* (Sykes, 1832)	LC	R
39		Grey Heron	*Ardea cinerea* Linnaeus, 1758	LC	R
40		Purple Heron	*Ardea purpurea* (Linnaeus, 1766)	LC	R
41	Threskiornithidae	Black Headed Ibis	*Threskiornis melanocephalus* (Latham, 1790)	NT	WM
42	Phalacrocoracidae	Little Cormorant	*Microcarbo niger* (Vieillot,1817)	LC	R
43	Sulidae	Oriental Darter	*Anhinga melanogaster* Pennant, 1769	LC	WM
44	Burhinidae	Eurasian Thick Knee	*Burhinus oedicnemus* (Linnaeus, 1758)	LC	R
45	Recurvirostridae	Black-winged Stilt	*Himantopus himantopus* (Linnaeus, 1758)	LC	WM
46		Pied Avocet	*Recurvirostra avosetta* Linnaeus, 1758	LC	WM
47	Charadriidae	Little Ringed Plover	*Charadrius dubius* Scopoli, 1786	LC	R
48		Red Wattled Lapwing	*Vanellus indicus (*Boddaert, 1783)	LC	R
49		River Lapwing	*Vanellus duvaucelii* (Lesson, 1826)	NT	R
50	Rostratulidae	Greater Painted Snipe	*Rostratula benghalensis* (Linnaeus, 1758)	LC	R
51	Jacanidae	Bronze Winged Jacana	*Metopidius indicus* (Latham, 1790)	LC	R
52		Pheasant-tailed Jacana	*Hydrophasianus chirurgus* (Scopoli, 1786)	LC	R
53	Scolopacidae	Eurasian Curlew	*Numenius arquata* (Linnaeus, 1758)	NT	WM
54		Spotted Redshank	*Tringa erythropus* (Pallas, 1764)	LC	WM
55		Wood Sandpiper	*Tringa glareola* Linnaeus, 1758	LC	WM
56		Common Greenshank	*Tringa nebularia* (Gunnerus, 1767)	LC	WM
57		Common Snipe	*Gallinago gallinago* (Linnaeus, 1758)	LC	WM
58	Glareolidae	Small Pratincole	*Glareola lactea* (Temminck, 1820)	LC	R
59		Indian Courser	*Cursorius coromandelicus* (Gmelin, 1789)	LC	R
60	Laridae	Brown-headed Gull	*Chroicocephalus brunnicephalus* (Jerdon, 1840)	LC	WM

S. No.	Family	Common Name	Scientific Name	IUCN Status	Local Status
61		Black-headed Gull	*Chroicocephalus ridibundus* (Linnaeus, 1766)	LC	WM
62		River Tern	*Sterna aurantia* (J.E. Gray, 1831)	NT	R
63	Pandionidae	Osprey	*Pandion haliaetus* (Linnaeus, 1758)	LC	WM
64	Accipitridae	Black Shouldered Kite	*Elanus caeruleus*(Desfontaines, 1789)	LC	R
65		Black Kite	*Milvus migrans* (Boddaert, 1783)	LC	R
66		Brahminy Kite	*Haliastur Indus* (Boddaert, 1783)	LC	R
67		Crested Serpent Eagle	*Spilornis cheela* (Latham, 1790)	LC	R
68		Short Toed Snake Eagle	*Circaetus gallicus* (Gmelin, 1788)	LC	R
69		Lesser Fish Eagle	*Haliaeetus humilis* (Müller & Schlegel, 1841)	NT	R
70		Egyptian Vulture	*Neophron percnopterus*(Linnaeus, 1758)	EN	R
71		Indian Vulture	*Gyps indicus*(Scopoli, 1786)	CR	R
72		White-rumped Vulture	*Gyps bengalensis* (Gmelin, 1788)	CR	R
73		Shikra	*Accipiter badius*(J.F. Gmelin, 1788)	LC	R
74	Tytonidae	Common Barn owl	*Tyto alba*(Scopoli, 1769)	LC	R
75	Strigidae	Indian Scops Owl	*Otus bakkamoena* Pennant, 1769	LC	R
76		Twany Fish Owl	*Ketupa flavipes* (Hodgson, 1836)	LC	R
77		Brown Fish Owl	*Ketupa zeylonensis* (Gmelin, 1788)	LC	R
78		Spotted Owlet	*Athene brama* (Temminck, 1821)	LC	R
79	Bucerotidae	Indian Grey Hornbill	*Ocyceros birostris* (Scopoli, 1786)	LC	R
80	Upupidae	Common Hoopoe	*Upupa epops* Linnaeus, 1758	LC	R
81	Picidae	Lesser Goldern-backed Woodpecker	*Dinopium benghalense* (Linnaeus, 1758)	LC	R
82		Brown-capped Pygmy Woodpecker	*Dendrocopos nanus* (Vigors, 1832)	LC	R
83		Eurasian Wryneck	*Jynx torquilla* (Linnaeus, 1758)	LC	WM
84	Ramphastidae	Coppersmith Barbet	*Psilopogon haemacephalus* (Statius Muller, 1776)	LC	R
85		Brown-headed Barbet	*Megalaima zeylanica* (Gmelin, 1788)	LC	R
86	Meropidae	Green Bee Eater	*Merops orientalis* Latham, 1801	LC	R
87		Chestnut headed Bee-eater	*Merops leschenaulti* Vieillot, 1817	LC	R
88	Coraciidae	Indian Roller	*Coracias benghalensis* (Linnaeus, 1758)	LC	R
89	Alcedinidae	Common Kingfisher	*Alcedo atthis*(Linnaeus, 1758)	LC	R
90		Pied Kingfisher	*Ceryle rudis*(Linnaeus, 1758)	LC	R
91		Stork Billed Kingfisher	*Pelargopsis capensis* (Linnaeus, 1766)	LC	R
92		White Throated Kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)	LC	R
93		Black-capped Kingfisher	*Halcyon pileata* (Boddaert, 1783)	LC	R
94	Falconidae	Common Kestrel	*Falco tinnunculus*Linnaeus, 1758	LC	WM
95	Psittaculidae	Plum Headed Parakeet	*Psittacula cyanocephala* (Linnaeus, 1766)	LC	R
96		Rose Ringed Parakeet	*Psittacula kremeri* (Scopoli, 1769)	LC	R
97	Pittidae	Indian Pitta	*Pitta brachyura* (Linnaeus, 1766)	LC	SM
98	Campephagidae	Black headed cuckoo shrike	*Lalage melanoptera* (Rüppell, 1839)	LC	SM
99		Large cuckoo shrike	*Coracina javensis* (Horsfield, 1821)	LC	R
100		White-bellied Minivet	*Pericrocotus erythropygius* (Jerdon, 1840)	LC	R
101	Oriolidae	Eurasian Golden Oriole	*Oriolus oriolus*(Linnaeus, 1758)	LC	R
102		Black-hooded Oriole	*Oriolus xanthornus* (Linnaeus, 1758)	LC	R
103	Dicruridae	Black Drongo	*Dicrurus macrocercus* Vieillot, 1817	LC	R
104		Greater Racket-Tailed Drongo	*Dicrurus paradiseus*(Linnaeus, 1766)	LC	R
105		Ashy Drongo	*Dicrurus leucophaeus* Vieillot, 1817	LC	WM

S. No.	Family	Common Name	Scientific Name	IUCN Status	Local Status
106	Rhipiduridae	White-browed Fantail	*Rhipidura aureola* Lesson, 1830	LC	R
107	Laniidae	Long-tailed Shrike	*Lanius schach* Linnaeus, 1758	LC	R
108		Brown Shrike	*Lanius cristatus* (Linnaeus, 1758)	LC	WM
109		Isabelline Shrike	*Lanius isabellinus* Hemprich & Ehrenberg, 1833	*LC*	WM
110	Corvidae	Indian Jungle Crow	*Corvus macrorhynchos*Wagler, 1827	LC	R
111		House Crow	*Corvus splendens* Vieillot, 1817	LC	R
112		Rufous Treepie	*Dendrocitta vagabunda* (Latham, 1790)	LC	R
113	Monarchidae	Indian Paradise Flycatcher	*Terpsiphone paradisi* (Linnaeus, 1758)	LC	R
114	Dicaeidae	Pale Billed Flowerpecker	*Dicaeum erythrorhynchos* (Latham, 1790)	LC	R
115		Thick-billed Flowerpecker	*Dicaeum agile* (Tickell, 1833)	LC	R
116	Nectariniidae	Purple Sunbird	*Cinnyris asiaticus* (Latham, 1790)	LC	R
117		Purple - rumped Sunbird	Leptocoma zeylonica (Linnaeus, 1766)	LC	R
118	Ploceidae	Baya Weaver	*Ploceus philippinus* (Linnaeus, 1766)	LC	R
119	Estrildidae	Scaly breasted munia	*Lonchura punctulata*(Linnaeus, 1758)	LC	R
120		Indian Silverbill	*Euodice malabarica* (Linnaeus, 1758)	LC	R
121		Red Avadavat	*Amandava amandava* (Linnaeus, 1758)	LC	R
122	Passeridae	Chestnut Shouldered Petronia	*Gymnoris xanthocollis* (E. Burton, 1838)	LC	R
123		House Sparrow	*Passer domesticus* (Linnaeus, 1758)	LC	R
124	Motacillidae	Yellow Wagtail	*Motacilla flava* Linnaeus, 1758	LC	WM
125		Citrine Wagtail	*Motacilla citreola* (Pallas, 1776)	LC	WM
126		Olive-backed Pipit	*Anthus Hodgsoni* (Richmond, 1907)	LC	WM
127		Tree Pipit	*Anthus trivialis* (Linnaeus, 1758)	LC	WM
128		Blyths Pipit	*Anthus godlewskii* (Taczanowski, 1876)	LC	WM
129	Emberizidae	Crested Bunting	*Melophus lathami (*J.E. Gray, 1831)	LC	R
130		Black-headed Bunting	*Emberiza melanocephala* Scopoli, 1769	LC	WM
131		Red-headed Bunting	*Emberiza bruniceps* Brandt, 1841	LC	WM
132	Alaudidae	Ashy-crowned Sparrow Lark	*Eremopterix griseus* (Scopoli, 1786)	LC	R
133		Greater Short-toed Lark	*Calandrella brachydactyla* (Leisler, 1814)	LC	WM
134		Rufous-tailed Lark	*Ammomanes phoenicura* (Franklin, 1831)	LC	R
135		Indian Bushlark	*Mirafra erythroptera* Blyth, 1845	LC	R
136	Cisticolidae	Plain Prinia	*Prinia inornata* Sykes, 1832	LC	R
137		Jungle Prinia	*Prinia sylvatica* (Jerdon, 1840)	LC	R
138		Zitting Cisticola	*Cisticola juncidis* (Rafinesque, 1810)	LC	R
139	Acrocephalidae	Paddyfield Warbler	*Acrocephalus agricola* (Jerdon, 1845)	LC	WM
140	Hirundinidae	Wire-tailed Swallow	*Hirundo smithii Leach*, 1818	LC	R
141		Barn Swallow	*Hirundo rustica* Linnaeus, 1758	LC	WM
142		Red-rumped Swallow	*Cecropis daurica* (Laxmann, 1769)	LC	R
143		Dusky Crag Martin	*Ptyonoprogne concolor* (Sykes, 1832)	LC	R
144	Pycnonotidae	Red Vented Bulbul	*Pycnonotus cafer* (Linnaeus, 1766)	LC	R
145		Red Whiskered Bulbul	*Pycnonotus jocosus* (Linnaeus, 1758)	LC	R
146		White-eared Bulbul	*Pycnonotus leucotis (*Gould, 1836)	LC	R
147	Phylloscopidae	Common Chiffchaff	*Phylloscopus collybita* (Vieillot, 1817)	LC	WM
148		Sulphur-bellied Warbler	*Phylloscopus griseolus* (Blyth, 1847)	LC	WM
149	Sylviidae	Lesser Whitethroat	*Sylvia curruca* (Linnaeus, 1758)	LC	WM
150		Yellow-eyed Babbler	*Chrysomma sinense* (Gmelin, 1789)	LC	R

S. No.	Family	Common Name	Scientific Name	IUCN Status	Local Status
151	Zosteropidae	Indian White Eye	*Zosteorps palpebrosus* (Temminck, 1824)	LC	R
152	Timaliidae	Indian Scimitar Babbler	*Pomatorhinus horsfieldii* (Sykes, 1832)	LC	R
153	Pellorneidae	Puff-throated Babbler	*Pellorneum ruficeps* Swainson, 1832	LC	R
154	Leiothrichidae	Brown-cheeked Fulvetta	*Alcippe poioicephala* (Jerdon, 1844)	LC	R
155		Common Babbler	*Argya caudata* (Dumont, 1823)	LC	R
156		Jungle Babbler	*Turdoides striata* (Dumont, 1823)	LC	R
157	Sturnidae	Brahminy Starling	*Sturnia pagodarum*(J.F. Gmelin, 1789)	LC	R
158		Asian Pied Starling	*Gracupica contra* (Linnaeus, 1758)	LC	R
159		Common Starling	*Sturnus vulgaris* Linnaeus, 1758	LC	
160		Common Myna	*Acridotheres tristis* (Linnaeus, 1766)	LC	R
161		Bank Myna	*Acridotheres ginginianus* (Latham, 1790)	LC	R
162		Jungle Myna	*Acridotheres fuscus* (Wagler, 1827)	LC	R
163	Muscicapidae	Bluethroat	*Luscinia svecica* (Linnaeus, 1758)	LC	WM
164		Common Stonechat	*Saxicola maurus* (Pallas, 1773)	LC	WM
165		Oriental Magpie Robin	*Copsychus saularis* (Linnaeus, 1758)	LC	R
166		Red Breasted Flycatcher	*Ficedula parva* (Bechstein, 1792)	LC	WM
167		Verediter Flycatcher	*Eumyias thalassinus* (Swainsin, 1838)	LC	WM
168		Black Redstart	*Phoenicurus ochruros* (S. G. Gmelin, 1774)	LC	WM
169		Indian Black Robin	*Saxicoloides fulicatus* (Linnaeus, 1766)	LC	R
170		Brown Rock Chat	*Cercomela fusca* (Blyth, 1851)	LC	R
171		Grey Bushchat	*Saxicola ferreus* Gray & Gray, 1847	LC	WM
172	Turdidae	Orange Headed Thrush	*Geokichla citrine* (Latham, 1790)	LC	R

Out of these 172 species, two species, Indian Vulture*Gyps indicus*andWhite-rumped Vulture *Gyps bengalensis*are critically endangered while one species, Egyptian Vulture *Neophron percnopterus* is an endangered species. Seven avian species are near threatened which included Painted Stork*Mycteria leucocephala*, Black-necked Stork *Ephippiorhynchus asiaticus*, Black Headed Ibis *Threskiornis melanocephalus*, River Lapwing *Vanellus duvaucelii*, Eurasian Curlew *Numenius arquata*, River Tern *Sterna aurantia*, Lesser Fish Eagle *Haliaeetus humilis*while on the other hand, Lesser Adjutant*Leptoptilos javanicus*and Woolly Necked Stork *Ciconia episcopus* are identified as vulnerable species.

From migratory point of view, there are two species which are summer migrants which included Indian Pitta*Pitta brachyura*and Black-headed cuckoo shrike *Lalage melanoptera*. On the other hand, number of winter migratory species is found to be 41 which are listed as under -

Common Teal *Anas crecca*

Northern Pintail*Anas acuta*

Ruddy Shelduck *Tadorna ferruginea*

Bar-headed Goose *Anser indicus*

Lesser Adjutant *Leptoptilos javanicus*

Black-winged Stilt *Himantopus himantopus*

Brown-headed Gull *Chroicocephalus brunnicephalus*

Black-headed Gull *Chroicocephalus ridibundus*

Osprey *Pandion haliaetus*

Eurasian Wryneck *Jynx torquilla*

Common Kestrel *Falco tinnunculus*

Pied Avocet *Recurvirostra avosetta*
Eurasian Curlew *Numenius arquata*
Spotted Redshank *Tringa erythropus*
Wood Sandpiper *Tringa glareola*
Common Greenshank *Tringa nebularia*
Common Snipe *Gallinago gallinago*
Tree Pipit *Anthus trivialis*
Blyth's Pipit*Anthus godlewskii*
Black-headed Bunting *Emberiza melanocephala*
Red-headed Bunting *Emberiza bruniceps*
Greater Short-toed Lark *Calandrella brachydactyla*
Paddyfield Warbler *Acrocephalus agricola*
Barn Swallow *Hirundo rustica*
Common Chiffchaff *Phylloscopus collybita*
Sulphur-bellied Warbler *Phylloscopus griseolus*
Ashy Drongo *Dicrurus leucophaeus*
Brown Shrike*Lanius cristatus*
Isabelline Shrike *Lanius isabellinus*
Yellow Wagtail*Motacilla flava*
Citrine Wagtail*Motacilla citreola*
Olive-backed Pipit *Anthus Hodgsoni*
Lesser Whitethroat *Sylvia curruca*
Bluethroat *Luscinia svecica*
Common Stonechat *Saxicola maurus*
Red Breasted Flycatcher *Ficedula parva*
Verediter Flycatcher *Eumyias thalassinus*
Black Redstart *Phoenicurus ochruros*
Grey Bushchat *Saxicola ferreus*
Black Headed Ibis *Threskiornis melanocephalus*
Oriental Darter *Anhinga melanogaster*

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Short Communication

SEX RATIO AND MATURITY STAGE OF THE WALLAGO ATTU FROM BHADAR RESERVOIR OF GUJARAT, INDIA

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INTRODUCTION

The species of *Wallago attu* was first described by Schneider as *Silurus attu* Srivastava. *Wallago attu* is commonly called as Padhani or Barari. It has good market demand as a food fish having high nutritional value and high protein content in its flesh. It is also popular as a good sport fish. Recently it has also been documented to be exported as indigenous ornamental fish from India (Gupta, 2015).

The sex ratio provides basic information to assess the reproductive potential and to estimates stock size of fish populations. The length-weight relationship is useful in determining the weight when only the length measurements are available, and it also indicates the condition of the fish and permits comparisons of the parameters of the relationship between species from different regions (Oliveira *et al.,* 2012). Information on the reproductive biology of fish is considered as paramount importance for sustainable management of exploited stock. It includes knowledge of fecundity, diet composition and sex ratio which are essential for evaluating the commercial potential of stock, life history, practical culture and actual management of the fishery (Kareem *et al.,* 2015).

MATERIALS AND METHODS

The present study is conducted at Bhadar reservoir landed of Rajkot district (Saurashtra region (22°30′N 70°78′33"E) in Gujarat, India. Bhadar reservoir (site) is located at 21°76′28"N 70°42′37" E near Bhukhi village Dhoraji, Taluka of Rajkot district during July 2018 to February 2019. Data collected from the sites at every 1 month interval. *Wallago attu* fishes were collected from selected site of reservoir. The fishermen are mainly using gill net for fishing. Fish samples were brought to college of Fisheries, Veraval and used 5% formalin solution in specimen jar according to the size of species.

Biological Parameters (Sex – ratio)

The month wise sex ratio has been determined and Chi-square test will be performed to test the homogeneity of male and female distribution (Neethiselvan et al., 2001).

Maturity studies

Maturity has been observed based on the stages given by (Acharya, 1990). It has been described three maturity stages (I-immature, II- maturing, III-mature) for males and five stages (I-immature, II-immature, III-maturing IV-mature, V-spent) for females.

RESULTS AND DISCUSSION

Sex Ratio

Monthly sex ratio of males and females was estimated. The overall sex ratio was 1:1.008. Results indicated dominance of females in July, August, September, 2018 and January, February, 2019 and male dominance in October, November, and December. (Table.1 & Fig.1).

Similar result reported by Hussain, (2013) he found 1:1.070 sex-ratio of the spiny eel, *Mastacembelus pancalus* (Hamilton) from Rajshahi, Bangladesh. Chi-square test indicates that the male and female distribution in natural population was highly significantly different at 0.001% level of significance in the month of June, July and August. That suggests the females were more abundant in the breeding period. Olalusi, (2014) observed in African Mud cat fish *Claraius gariepinus* from Nigeria. Khalid *et al.,* (2010) has founded that the overall sex – ratio deviated of female in *ilisha melastoma.* However, the sex ratio was approximately 1:1 in certain months it was in favor of female. Month wise distribution on sex's fluctuated significantly in favor of female in May, June, August, and February while in November it showed the favor for male.

Table – 1 : Monthly Variation in the Sex - ratio of *W. attu*

Month	Number of Individuals			Sex – ratio (M:F)	P-value	Chi-square
	Male	Female	Total			
JULY	6	9	15	1:1.50*	0.23	45.00
AUGUST	12	22	34	1:1.83*	0.90	97.75
SEPTEMBER	7	8	15	1:1.14	0.13	40.17
OCTOBER	23	15	38	1:0.65	0.04	147.37
NOVEMBER	23	12	35	1:0.52	0.24	126.05
DECEMBER	20	17	37	1:0.85	0.77	139.36
JANUARY	13	16	29	1:1.23	0.67	113.27
FEBRUARY	8	14	22	1:1.75*	0.50	88.00
Total	**112**	**113**	**225**	**Average 1:1.008**	**0.44**	**99.62**

* = Female in the population higher.

Maturity

Sexual maturity of individuals was studied by observing the different developmental stages of ova, which were distinguished by microscopic and macroscopic stages of ovary. Immature stages (I & II) were observed in all the months, whereas mature stages (III & IV) were too observed in July, August. But, spent condition (V) was observed only in the months of October, November, December and January.

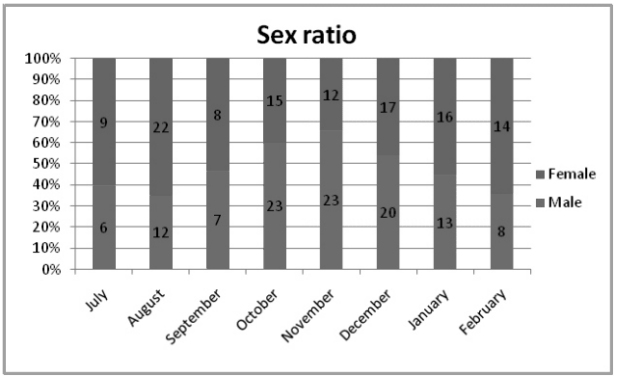

Fig. - 1 : Monthly variation in the percentage of Males & Females Sex ratio

CONCLUSION

Present study was near Bhukhi village Dhoraji Taluka of Rajkot district of Gujarat at Bhadar reservoir were suitable environment condition for *W. attu* fish. The overall sex ratio was 1:1.008 and the females dominated in the population during July, August, and September. Male was October, November and December. Stages of ovary. Immature stages (I & II) were observed in all the months, whereas mature stages (III & IV) were too observed in July, August. But, spent condition (V) was observed only in the months of October, November, December and January. Sex ratio is play the major role of maturity and spawanig activity of fishes.

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Review Article

HYPOTHETICAL DATA SOCIAL CATEGORIZATION ON INTER GROUP CONTACT IN U.P. (INDIA)

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INTRODUCTION

On the basic of general idea, Several different model of Inter group contact have been developed, each making some what different predications of the optimal conditions for effective contact experience.

1. Decategorization Model :-

The Hypothetical data social categorization on Inter group in U.P. the first modal passed on the idea that contact with be most effective in interactions are person – based rather than category– based (Brewer and miller, 1984) A primary consequences of categorization is the depersonalization of members of the out-group Social behavior in Categorization based-interactions is characterized by a tendency to treat individual member of the out – group of undifferentiated representatives of a unified social category, impendent of individual differences that may exist with in groups. This perspective on the contact situations suggests that intergroup interactions should be structured so as to reduce the salience of category distinctions and to promote opportunities to get to know out-group member as individuals Attending to personals characteristics of group member not only provide the opportunity to disconfirm category stereo types, it also break down the monolithic perception of the out- groups as a homogeneous unit (wilder 1978) In this scheme , the complete situation encourages attention to information at the individual lived that replaces category identity as the most useful basic for classifying participant , beware and miter(1984) a spume that such contact experience effectively breakdown stereo typing & Prejudice because undermine the availability and usefulness of in group – out group categorization in interactions with group members.

2. Conditions of Intergroup Contact:-

In the year prior to All Port's framing of intergroup contact theory, social scientists has already begun discussing the conditions of intergroup contact that would intergroup anxiety, prejudice or other " deter mental psychological effects". Wilner, walkly and coor, two year prior to the nature of prejudice, studied segregation and integration in housing projects and also suggested four conditions. Under which intergroup attitudes would changes for the better, under the assumption that pre juice arise from racial segregation , they suggested that it would diminish when members occupy " The same or equivalent rules in the

situation." Share background characteristics like education ,age, gender or socio economic status , perceive common interests or goods and when the " Social climate is not Unfavorable to interracial association.

3. Psychological Processes involved in intergroup Contact:-

A number of psychological processes have been hypothesized to explain how and why intergroup contact is able to reduce prejudice and improve intergroup relations.

1. Allport (1954) argued that intergroup contact facilitates learning about the out-group and this new out group knowledge leads to prejudice reduction.

2. Intergroup contact is believed to reduces the fear and anxiety people have when interacting with the out-group which in turn reduces their negative evaluation of the out group.

3. Intergroup contact hypothesized to increase people activity to take the perspective of the out group and empathies with their concerns.

Empirical research has only behind weak support for role of out group knowledge in prejudice reduction however the affective mechanisms of inter group anxiety and out group empathy have accumulated extensive empirical support.

4. The effects of intergroup Contact:-

Social Scientist have documented positive effects of intergroup contact across field, experimental and correlate at studies across a variety of contact situations and between various social groups, Pettigrew and Tropp's cronical 2006 data analysis of 512 separate studies found general support for the contact hypothesis. Furthermore, their analysis found that face- to –face contact between group member significantly reduced prejudice the more contact groups had the prejudice group member reported .Moreover the beneficial effects of intergroup contact were significantly greater. When the contact situation was structured to include Allport's facilitating conditions for optimal contact.

Indirect Intergroup Contact:-

One of the most important advances in research on intergroup contact is the growing evidence for a number of indirect, non –face-to face intergroup contact strategies as a means to improve relations between social groups, while the benefits of direct intergroup contact have been empirically established, its implementation is offer not practical. For example in many countries social and religious groups are often residentially, educationally or occupationally segregated, Which limits the opportunity for direct contact however, even when the opportunity for direct contact is high , Anxiety and fear can produce a negative or positive contact experience or head to the avoidance of the contact situation altogether. Indirect forms of intergroup contact include.

Extended Contact:-

The extended contact hypothesis, established by Wright and colleagues in 1997, posits that knowing that a member of one's own group has a close relationship with a member of an out group can lead to more positive attitudes towards that out group correlation research had demonstrated that individuals who report knowledge that an in group member has an out group friend typically report more positive out group attitudes, while experimented research as shown that providing in group members with information creates the same positive effect.

Imagined Contact:-

The imagined contact hypothesis was put forward by Richard J. Crisy and Rhianan tunner (2009) and propose that simply imagining a positive encounter with a member or member's of on out

group category can promote more positive intergroup attitudes.

Electronic or E- Contact:-

Fiona white and her colleagues (2012-2014) recently developed Electronic and E-Contact, in values an in group member interacting with an in group member interacting with an out group member over the internet and includes text based, video based on line interaction.

Criticisms:-

While large bodies of research have been devoted to examine info group contact social scientific reviews of the literature frequently Skeptics about the likely hood of contacts optimal condition occurring in concern and by expansion about the generals ability of correlation research and lab studies in contact.

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SURGICAL OPERATION OF ATRESIA ANI (IMPERFORATE ANUS) IN A RAM LAMB

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ABSTRACT

Atresia ani is a congenital embryological anomaly in which the hindgut fails to fully communicate with the perineum. The anus may be either stenotic or imperforate; atresia ani may appear alone or in combination with rectovaginal or recto vestibular fistula (RVF). It is a congenital abnormality, manifested clinically by an absence of faeces, dullness, and anorexia with abdominal distension, discomfort and straining at an attempt to defecate. Rectal lumen usually bulges subcutaneously at normal site of the anus when the abdomen is compressed. These congenital defects were corrected surgically under caudal epidural analgesia using 2% Lignocaine hydrochloride. The present case report describes successful surgical intervention of atresia ani in a new born ram lamb.

Keyword: *Atresia ani, congenital abnormality, Rectum, Ram lamb. Lignocaine hydrochloride.*

INTRODUCTION

The structural or functional defects that occur during embryogenesis and can be identified after birth are called inherited anomalies. The genetic or environmental factors or sometimes combination of both are responsible for these defects **Badawy A.M. (2011).** Genetic factors like defect in chromosome numbers, single gene defect and recessive gene. Environmental factors such as nutrition, maternal disease, plastic and its components and use of pesticides in feed are accountable for teratogenic anomalies during embryogenesis. Sometimes these anomalies lead to decline in the productivity of dam and economic value of neonates. *Atresia ani* also known as imperforate anus is an inherited embryological anomaly mainly due to the failure of the anal membrane to cessation or sometimes thin membrane covering normal anal orifice. This defect may progress when a dorsal part of the cloacal plate fails to form and in female it is accompanied by agenesis of genitalia **Chaudhary G.R. et al.(2016).** *Atresia ani* is common genetic disorder in the male pigs and calves which might be due to an Autosomal recessive gene. **Kilic N et al., (2004)** Atresia ani is the failure of the anal membranes to break down. Affected animals may survive for up to ten days and can be identified by their depression, anorexia, colic, marked abdominal distension and lack of faeces, faeces being replaced by thick white mucus, **Radostitis *et al* 2000**. This surgical report communicates a case of atresia ani (imperforate anus) in ram lamb, which was successfully treated by surgical intervention.

CASE HISTORY AND CLINICAL OBSERVATIONS

A five day old male, non-descript ram lamb was presented at Veterinary Hospital, chaka block,

Prayagraj, Utter Pradesh (India) with the history of non – passage of faeces since birth. After birth, ram lamb was stand and suckle normally but weak. On clinical observation, closely find with principal clinical signs of dull, depression, anorexia, attempt of defecation and mild abdominal distention. Also the signs of tenesmus and abdominal pain were observed but does not voided out the faeces. The case was diagnosed as atresia and handover for surgical intervention.

RESULTS AND DISCUSSION

The perineal reconstruction was undertaken surgically under local anesthesia as described by **Frank (1964).** Atresia Ani (imperforate anus) was treated by excision of a circular piece of anal skin. The rectum was exposed after due dissection of the perineal muscles therein. This was done by putting four stitches were dorsally, ventrally and laterally on both sides. Post-operatively, Fortivir@ 2ml (Enrofloxacin 10%W/V) for 5 days and Tolfine (Tolfenamic acid) @1ml for 3 days were administered intramuscularly, followed by routine dressing and application of fly repellent Charmil spray at the operative site to prevent cicatrisation. The sutures were taken off on 8th day post-operatively. Congenital anomalies (of digestive system) frequently occur due to genetic or environmental forces, or a combination of both, during the process of embryogenesis **(Oehme and Prier, 1974; Mishra and Angelo, 1980).** Animal recovered uneventfully without any complications on 10th day.

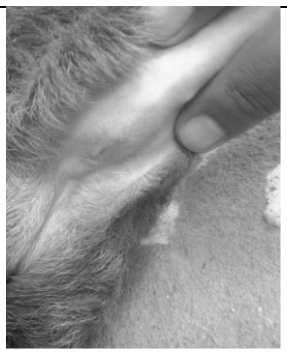

Fig. no. 1. Ram Lamb showing bulging in the perineal region due to Atresia ani

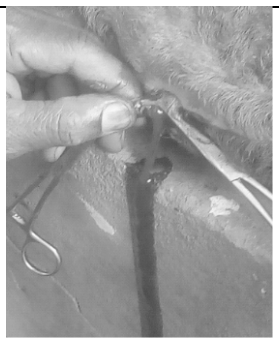

Fig 2: Photograph showing the muconium immediately after incision

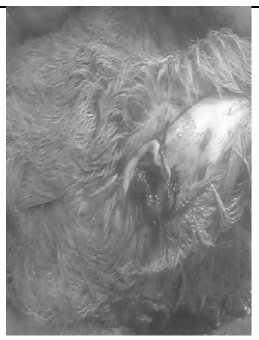

Fig 3. Primal reconstruction (Atresia ani) & Ram Lamb stand with minimum tenesmus immediate after surgery.

CONCLUSION

It is concluded that, surgical intervention is the only possible solution to treat such congenital defects in animals to so as to make them survive.

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