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GREEN MANURING: A LOW COST TECHNIQUE TO ENHANCE SOIL HEALTH AND SUSTAINABILITY IN RICE-WHEAT CROPPING SYSTEM

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ABSTRACT

Although soil is a store house of major and minor crop nutrients,it is no means inexhaustible . By continuous cultivation and without any recoupment the soil is gradually derived of the vital nutrients. Nitrogen is most important nutrient element influencing the level of crop yields. As a result of intensive farming the soils have also become deficient in most of the major as well as minor elements like zink, required for balance nutrition of crops. Green manuring and FYM are the important source for to the improvement of the soil fertility and crop productivity as well. Due to mechanized farming by using machinery and decreasing cattle population, the use of green manuring can give the answer for this problem. Green manuring is the easiest way of supplying readily decomposable organic matter to soils. The practice of growing the green manuring is widely prevalent till modern time from back 500 BC. However, the emphasis on it decreased after the sixties due to the introduction of intensive farming system and easy availability of chemical fertilizer. With the energy crisis of the mid nineties green manuring has again become popular, mainly due to the limited supply of other organic matter sources such as cattle manure, compost , FYM and due to the high cost of chemical fertilizers. Soil health is one of the major requirements for successful plant growth. But most of agricultural soils are deficient in organic matter and nutrients. If practices for soil health improvement and maintenance are not included in agricultural system, it can be very hazardous in future. Thus green manuring is one of the important possible options in achieving the ultimate goal of sustainable crop yield improvement with soil health. The sole objective of this article was to review the advances in green manuring technology.

Keywords : *Nutrients, green manure, soil health, sustainability, cropping system*

INTRODUCTION

Green manuring is a practice of plugging in the green plants tissue grown in the field or adding green plants with tender twigs or leaves from outside and incorporating them into the soil for improving the physical structure as well as fertility of the soil.Green manuring ia a part of organic farming. Organic matter in the soil is known for its genuine soil fertility as one of its most important elements. Green manuring and FYM are the important source for to the improvement of the soil fertility and crop productivity as well. Due to mechanized farming by using machinery and decreasing cattle population, the use of green manuring can give the answer for this problem. Green manuring is the easiest way of supplying readily decomposable organic matter to soils. With the energy crisis of the mid nineties green manuring has again become popular, mainly due to the limited supply of other organic matter sources such as cattle manure, compost , FYM and due to the high cost of chemical fertilizers.

Thus green manuring is one of the important

possible options in achieving the ultimate goal of sustainable crop yield improvement with soil health. The sole objective of this article was to review the advances in green manuring technology.

Sustainable agriculture depends on using green manure instead of synthetic fertilizers. Sustainable production techniques are a component of organic farming and aid in re-establishing the natural equilibrium that has been disturbed by improper farming methods. A lot of benefits exist for the economy and the environment when using green manure on agricultural land. Methods including green manure must be used as a new agricultural approach for sustainable growth. Green manure technologies were found to provide farmers with a range of benefits, such as increased yields, carbon sequestration, nitrogen fixation, an increase in SOC content, biodiversity preservation, etc. A system of ecological compensation as a novel approach to sustainable farming may become widely adopted as a result of high ecosystem service values and low farmer economic rewards.

Table 2. Amount of nitrogen and organic matter turned under by some green manure crops

Green manure crop	N turned under (kg ha−1)	Organic matter (kg ha−1)
Sunn hemp	75-80	18,500
Guar	60-118	18,500
Dhaincha	75-88	15,950
Senji	113	14,250
Berseem	60	14,000
Arhar	45	-
Cowpea	58	-

Source:Tanveer et al.

The use of green manure is thought to be a crucial strategy for reducing the effects of salt stress. The importance of including green manuring crops in crop rotations.

Table - 1 : Green manure crops grown in Tropics

Northern Region	Southern Region
1. Dhaincha (Sesbania aculeata) 2. Sunnhemp (Crotolaria juncea) 3. Berseem (Trifolium alexandrium) 4. * Dhaincha (Sesbania rostrata)	1.Dhaincha (Sesbania aculeata) 2.Sesbania (Sesbania speciosa) 3.Wild indigo (Tephrosia purpurea) 4.Pillipesara (Phaseolus triloba) 5.Sunnhemp (Crotolaria juncea) 6.Aviri (Indigofera tinctoria)
Weastern Region	**Eastern Region**
1. Cowpea (Vigna sinensis) 2. Senji (Melilotus alba) 3. Khesari (Lathyrus sativus) 4. Green gram /Moong bean (Vigna radiata) 5. Cluster bean /Guar (Cyamopsis tetragonoloba)	1.Senji (Melilotus alba) 2.Horse gram (Dolichos biflorus) 3.Cowpea (Vigna sinensis) 4.Clusterbean (Cyamopsis tetragonoloba) 5.Sunnhemp (Crotolaria juncea) 6.Wild indigo (Tephrosia purpurea)

Principles of Green Manuring:

i. Green manure crop should be grown in irrigated area or where annual rainfall is more than 30 inches. Lack of moisture is harmful for the growth of the crop as well as for decomposition. An un-decomposed crop may harm the subsequent crop by upsetting the balance of carbon and nitrogen.

ii. After green manuring subsequent crops should be sown in well decomposed crops. Un-decomposed green manure may cause poor germination, and problem of diseases and insects.

iii. In irrigated area, the best stage at which the crop should be incorporated in the soil as a green manure is when it reaches the flowering stage. In rainfed or dry region, green manure crop should be incorporated before flowering stage (tender or leafy stage).

iv. Green manure crop should be quick growing.Preferably from the legume family.It should have deep root system.

Table - 2 : Classification of Green Manure

Green Manure			
Legumes		**Non Legumes**	
Green Manure	**Green Leaf Manure**	**Green Manure**	**Green Leaf Manure**
Daincha	Gliricidia	Sunflower	Calotropis
Sunhemp	Cassia	Buck wheat	Adathoda
Kolinji	Pongamia glabra		Thespesia

What makes a good green manure?

* Well adapted to climate and region.
* Well adapted to your soil conditions.
* Rapid growth characteristics of green manure crops.
* High biomass production .
* High rate of nitrogen fixation.
* Requires minimal management during growth.
* Fits crop rotation – does not interfere with other crops in the rotation and fits in potential openings for green manure inclusion.
* Readily available seed of selected green manure crops.

Must be low cost seed.

* Inoculant of selected crops must be available.
* Economical – in terms of seed cost and in terms of services provided.
* Will not become weedy, or can be managed to prevent weediness.
* Competes well with crop land weeds.
* Uses water efficiently.
* Provides ground cover in critical periods.
* Termination, decomposition and nitrogen mineralization to match needs of subsequent crop
* Palatable and non-toxic should grazing or haying be desired

What should consider before planting a green manure?

Do I need to consider soil moisture conservation in my crop and management choices?

* How fertile are my soils? Will they benefit

from the potential N fixation from a green manure?

* Do I have room in my crop rotation to grow a green manure to the bloom stage?
* How much nitrogen do I need from the green manure? Does the expected nitrogen fixation from an established green manure meet or exceed this need?
* Is seed readily and affordably available?
* Do I want to graze or hay the green manure?
* Can I terminate the green manure early if establishment is poor or weed pressure is high?

Do management operations (planting, termination) interfere with other essential operations for cash crops on my farm?

* How will I terminate and incorporate the green manure?
* Do I have (or have access to) the proper equipment for planting and terminating the green manure crop?
* Is the field weedy, so that I should favour quickly growing or high biomass species over less competitive green manure crops?
* What is my backup plan should soil conditions not allow timely seeding, high weed pressure, etc.?
* Are there pests that I should expect with this green manure? Do I have a management plan in place if there are? Are there more resistant varieties that I could choose?

Table - 3 : Nutrient contents of green manure crop and weeds on dry basis

S. No.	Plant	Botanical name	Nutrient content (%) on air dry basis		
			N	P	K
	Green manure crop				
1.	Sunnhemp	Crotolaria juncea	2.30	0.50	1.80
2.	Dhaincha	Sesbania aculeata	3.50	0.60	1.20
3.	Sesbania	Sesbania speciose	2.71	0.53	2.21
4.	Cowpea	Vigna sinensis	1.70	0.28	1.25
5.	Mungbean	Vigna radiate	2.21	0.26	1.26
	Green leaf manure				
6.	Gliricidia	Gliricidia sepium	2.76	0.28	4.60
7.	Pongamia	Pongamia pinnata	3.31	0.44	2.39
8.	Neem	Azadiracta indica	2.83	0.28	0.35
9.	Gulmohar	Delonix regia	2.76	0.46	0.50
10.	Peltophorum	Peltophorum ferrugenum	2.63	0.37	0.50
	Weeds				
11.	Parthenium	Parthenium hysterophorus	2.68	0.68	1.45
12.	Water hyacinth	Eichhornia crassipes	3.01	0.90	0.15
13.	Trianthema	Trianthema partulacastrum	0.64	0.43	1.30
14.	Ipomoea	Ipomoea	2.01	0.33	0.40
15.	Calotropis	Calotropis gigantean	2.06	0.54	0.31
16.	Cassia	Cassia fistula	1.60	0.24	0.20

Table - 4 : Biomass production and Nutrient accumulated by green manure crops.

S. No.	Crop	Dry matter in 45-60 DAS (q/ha)	Nutrient accumulation						
			Major nutrients (kg)			Total micro nutrients (g)			
			N	P2O5	K2O	Zn	Fe	Cu	Mn
1.	*Sesbania rostrata*	50.00	131.0	18.5	62.5	200	9840	180	1050
2.	*Sesbania speciosa*	30.00	119.4	07.2	39.0	150	1440	132	330
3.	*Gliricidia maculata*	35.00	125.6	125.6	46.8	108	1980	68	540
4.	*Eichhornia crassipes*	70.00	198.1	63.0	125.3	350	3290	133	2940
5.	*Crotolaria juncea*	52.50	150.2	47.3	93.9	262	2467	100	2205
6.	*Trianthema spp.*	25.00	58.5	07.5	28.7	75	4980	47	500
7.	*P. hysterophorus*	40.00	106.4	35.2	51.6	280	1880	76	640

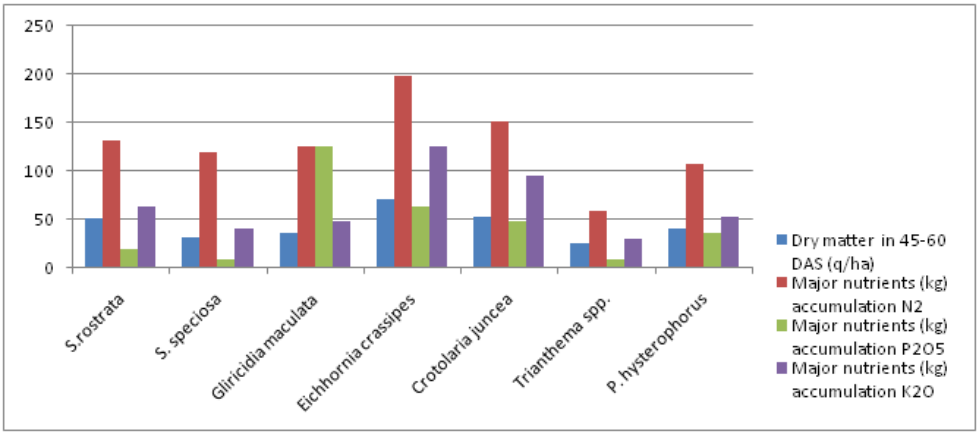

Fig.: Biomass production and Nutrient accumulated by green manure crops.

CONCLUSION

Agriculture can be more sustainably produced by using green manureas a conservation technique. Due to improper agronomic methods, there was a significant loss of soil fertility, which is a very bad example of human-induced land degradation. Green manuring is an inexpensive, co-friendly alternative to cut down the use of chemical in agriculture and has become an effective technology ensuring productive capacity of soil without causing environmental problem. Application of green manure crops supplement the chemical fertilizers and restore soil fertility. Thus green manure is an eco-friendly, low cost technology to conserve the natural resources besides maintaining the environmental quality in

sustainable manner. In conclusion, it may be stated that green manuring may be one of the many appropriate alternatives to achieve desired ecological and agronomical sustainability and thus increase agricultural yields.

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DIVERSITY AND DISTRIBUTION OF MAMMALS OF PENCH TIGER RESERVE, MADHYA PRADESH INDIA

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ABSTRACT

The mammals observed in the Pench Tiger Reserve, Seoni, and Chhindwada districts are the subject of this paper. This paper shows a systematic account for 50 species that are recorded within the PTR area and belong to 42 genera, 21 families, and 9 orders.

Keywords **:** *Pench tiger reserve, mammals, systematic account*

INTRODUCTION

Mammals are warm-blooded vertebrates, distinguished from other vertebrates by the presence of mammary or milk glands in females and body hair. Mammals give birth to their young, except the primitive mammals (Prototheria), which lay eggs like reptiles and birds. Female mammals nourish their young with milk produced by the highly specialized mammary or milk glands. Worldwide, some 5418 species of mammals are known to science, which vary from tiny shrews to gigantic elephants (Wilson and Reeder, 2005).

Studies on the mammals of Madhya Pradesh State including protected areas have been done by various workers viz., Harshey and Chandra (2001,2007), Ramakrishna *et al*. (2006), Ghose & Bhattacharya (1995), Ghose (1995), Chakraborty (2008), Harshey (2009, 2014), Harshey & Chandra (2009), Harshey and Talmale (2016a, b) and Talmale (2017). Literature reveals that there is no consolidated information is available on mammals of Pench Tiger Reserve, Madhya Pradesh available.

This paper deals with mammals observed in Pench Tiger Reserve, Seoni and Chhindwada districts. Systematic account of 50 species belong to 42 genera 21 families and 9 orders recorded from the PTR area is provided in the present paper. Systematic arrangement of the species as per Wilson and Reeder, 2005.

SYSTEMATIC LIST OF THE MAMMAL SPECIES RECORDED FROM PENCH TIGER RESERVE, MADHYA PRADESH

SYSTEMATIC ACCOUNT

CLASS: MAMMALIA

Order SCANDENTIA

Family TUPAIIDAE

Genus ***Anathana*** Lyon, 1913

1. ***Anathana ellioti*** (Waterhouse, 1850)

1850. *Tupaia ellioti* Waterhouse, *Proc. Zool. Soc. Lond.* 1849 : 107.

Common Name: Madras Treeshrew

Locality: Tiple & Talmale (2013) reported from Karmazari, Pench Tiger Reserve, M.P.

Habit: Terrestrial, arboreal and diurnal.

Habitat: Preferring to move on the forest floor among fallen leaves in search of food. Prefers to live in scrub jungle, dry and moist deciduous forests.

Distribution: Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu and West Bengal (Harshey and Chandra, 2007; Tiple and Talmale,2013). *Elsewhere* : None. Species endemic to India.

Conservation status : *IUCN* : Least Concern; *CITES* : Appendix II (Scandentia spp.).

Subfamily CERCOPITHECINAE

Genus ***Macaca*** Lacepede, 1799

2. ***Macaca mulatta*** (Zimmermann, 1780)

1780. *Cercopithecus mulatta* Zimmermann, *Geogr. Gesch. Mensch.*, **2**: 195.

Common Name: Rhesus Macaque

Locality: Karmajhiri, Jamtara, Rukhad, Totladoh; June-Dec., 2001.

Habit: Semi-arboreal, mostly terrestrial.

Habitat: Semi-urban, urban and forested areas.

Distribution: Throughout Northern India (North of Godavari) up to Assam. *Elsewhere*: Indo-China, Myanmar.

Conservation status: IUCN: Least Concern, Indian Wildlife (Protection) Act (1972, as amended upto 2006) (IWPA): Schedule: II Part I, CITES: Appendix II.

Subfamily COLOBINAE

Genus ***Semnopithecus*** Desmarest, 1822

3. ***Semnopithecus entellus*** (Dufresne, 1797)

1797. *Simia entellus* Dufresne, *Bull. Soc. Philom.*, *Paris*, **I**, 7: 49.

Common Name: Hanuman Langur

Locality: Karmajhiri, Jamtara, Rukhad, Totladoh; June-Dec., 2001.

Habit: Arboreal.

Habitat: Semi-urban, urban and forested areas.

Distribution: Throughout India. *Elsewhere*: Bangladesh, Pakistan.

Conservation Status : IUCN: Least Concern, IWPA: Schedule II Part I; CITES: Appendix I.

Order RODENTIA

Suborder SCIUROMORPHA

Family SCIURIDAE

Subfamily RATUFINAE

Genus : ***Ratufa*** Gray, 1867

4. ***Ratufa indica centralis*** Ryley, 1913

1913. *Ratufa indica centralis* Ryley, *J. Bombay nat. Hist. Soc.,* **22** (3) : 436.

Common Name: Indian Giant Squirrel.

Locality: Thick forested areas of Pench Tiger Reserve. Type locality of this taxa is Bori, Pachmarhi Biosphere Reserve, Hoshangabad District, and also reported from Kanha Tiger Reserve, Madhya Pradesh are not very far, hence its possible occurrence in PTR is not ruled out.

Habit: Arboreal and diurnal. They are shy and construct their nests on the tree tops and not so easy to locate.

Habitat: They live in thick forests. They keep to the canopies and seldom come on the ground.

Distribution: Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh (Pachmarhi Biosphere Reserve, Kanha Tiger Reserve), Maharashtra, Odisha, Tamil Nadu (Talmale, 2017). *Elsewhere*: None. Indian Endemic species.

Conservation Status : IUCN: Least Concern, IWPA: Schedule II Part II; CITES: Appendix II (*Ratufa* spp.) (valid from 5 February, 2015).

Subfamily SCIURINAE

5. ***Petaurista philippensis*** (Elliot, 1839)

1839. *Pteromys philippensis* Elliot, *Madras J. Litt. Sci.*, **10** : 217

Common Name: Common Giant Flying Squirrel

Locality: This species is known to occur in P.T.R.

Habit: Arboreal.

Habitat: Deciduous, mixed forests.

markedly darker than the sides, shoulders or parachutes. Underparts lighter in colour.

Distribution: India: Bihar, Gujarat, Madhya Pradesh (Kanha Tiger Reserve (Ghose & Bhattacharya, 1995); Pachmarhi Biosphere Reserve (Harshey & Chandra, 2009); Bandhavgarh Tiger Reserve (Harshey,2009), Maharashtra, Karnataka, Kerala, Odisha, Rajasthan, Tamil Nadu and West Bengal (Agrawal and Chakraborty, 1979; Talmale, 2017). *Elsewhere*: Sri Lanka, Myanmar, Thailand, S. China and Taiwan (Talmale, 2017).

Conservation Status : IUCN: Least Concern, IWPA: Schedule II Part II; CITES: Appendix II (*Ratufa* spp.) (valid from 5 February, 2015).

Remarks : *Petaurista philippensis* was earlier considered to be a subspecies of *Petaurista petaurista*. However *Petaurista philippensis* has been considered as a valid species by Corbet and Hill (1992) and also maintained by Thorington and Hoffmann (2005).

Subfamily CALLOSCIURINAE

Genus ***Funambulus*** Lesson, 1835

6. ***Funambulus palmarum robertsoni*** Wroughton,1916

1916. *Funambulus robertsoni* Wroughton, *J. Bombay nat. Hist. Soc.*, **24**: 647.

Common Name: Three Striped Palm Squirrel.

Locality: Karmajhiri, Rukhad, Jamtara, Totladoh, Ghat Kohka in Pench Tiger Reserve; June-Dec., 2001.

Habit: Arboreal, diurnal, commensal of humans.

Habitat: Near human habitation, forest.

Distribution: Throughout Central India. *Elsewhere* : None. Subspecies endemic to India.

Conservation status : .IUCN : Least Concern.

7. ***Funambulus pennantii*** Wroughton, 1905

1905. *Funambulus pennanti* Wroughton, *J. Bombay nat. Hist. Soc.*, **16**: 411.

Common Name:Five Striped Palm Squirrel

Locality: This species is known to occur in P.T.R.

Habit: Arboreal, nocturnal, commensal.

Habitat: Human habitation, forest.

Distribution: Throughout India but more widespread in Central and Northern India. *Elsewhere*: Iran, Nepal, and Pakistan.

Conservation status : *IUCN* : Least Concern; IWPA: Schedule IV .

Suborder MYOMORPHA

Superfamily MUROIDEA

Family MURIDAE

Subfamily GERBILLINAE

Genus ***Tatera*** Lataste, 1882

8. ***Tatera indica*** (Hardwicke, 1807)

1807. *Dipus indicus* Hardwicke, *Trans. Linn. Soc. Lond.,* **8** : 279.

Common Name : Indian Gerbil or Antelope Rat.

Locality: Reported from throughout Madhya Pradesh, hence its possible occurrence in PTR is not ruled out.

Habit: Terrestrial, fossorial and nocturnal.

Habitat: The species is basically a field rat and generally lives in cultivated plains, gardens, orchards pastureland, crop fields, waste lands and forests.

Distribution: India : Andhra Pradesh, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh,

Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal. *Elsewhere*: Nepal, east to the Ganges delta, West through Pakistan and South Afghanisthan, Iran and Iraq to Syria and south to Sri Lanka (Corbet and Hill, 1992).

Conservation status : *IUCN* : Least Concern; IWPA: Schedule V (Vermin).

Subfamily MURINAE

Genus ***Bandicota*** Gray, 1873

9. ***Bandicota bengalensis bengalensis*** (Gray and Hardwicke, 1833)

1833. *Arvicola bengalensis* Gray and Hardwicke, *Illustr. Indian Zool.*, **2**: pl. 21.

Common Name: Lesser Bandicoot Rat.

Locality: Commonly sighted near agricultural fields around the Pench Tiger Reserve.

Habit : Terrestrial, fossorial and nocturnal.

Habitat : The species is basically a field rat and generally lives in cultivated plains, gardens, pasture land, crop fields, waste lands, forests.

Distribution: Throughout India. *Elsewhere* : Indo-China, Bangladesh, Indonesia, Myanmar, Nepal, Pakistan, Sri Lanka.

Conservation Status: IUCN: Least concern; Indian Wildlife (Protection) Act (1972, as amended upto2006): Schedule V (Vermins).

10. ***Bandicota indica indica*** (Bechstein, 1800)

1800. *Mus indicus* Bechstein, In Pennant, *Allgemeine Ueber Vierfuss. Thiere*, **2**: 497.

Common Name: Larger Bandicoot Rat.

Locality: This species is known to occur in Pench Tiger Reserve.

Habit: Terrestrial and Fossorial.

Habitat: Cultivated fields, swampy areas, forest fringes, godowns and near human habitations.

Distribution: Throughout the peninsular India. *Elsewhere* : Pakistan and Sri Lanka.

Conservation Status: IUCN: Least concern; IWPA: Schedule V (Vermin).

Genus ***Golunda*** Gray, 1837

11. ***Golunda ellioti ellioti*** Gray, 1837

1837. *Golunda ellioti* Gray, *Charlesworth's Mag. nat. Hist.*, **1**: 576.

Common Name : Indian Bush Rat.

Locality: This species is known to occur in P.T.R.

Habit: Terrestrial, arboreal.

Habitat: Bush, scrub jungle and nurseries in forests.

Distribution: Almost throughout India. *Elsewhere*: Iran, Nepal, Pakistan, Sri Lanka.

Conservation status : *IUCN* : Least Concern; IWPA: Schedule V (Vermin).

Genus ***Madromys*** Sody, 1941

12. ***Madromys blanfordi*** (Thomas, 1881)

1881. *Mus blanfordi* Thomas, *Ann. Mag. nat. Hist.*, **7**: 24.

Common Name : Blanford's Rat, White Tailed Wood Rat.

Locality: This species is known to occur in P.T.R.

Habit: Fossorial.

Habitat: Dry or moist deciduous forests, evergreen forests, sometimes among rocks or scrubs.

Distribution: Andhra Pradesh, Bihar, Chhattisgarh, Goa, Gujarat, Madhya Pradesh, Maharashtra, Kerala, Odisha, Tamil Nadu, West Bengal. *Elsewhere*: Sri Lanka and Bangladesh

Conservation Status : *IUCN* : Least Concern; *IWPA*: Schedule V (Vermin).

Genus ***Millardia*** Thomas, 1911

13. ***Millardia meltada meltada*** (Gray, 1837)

1837. *Golunda meltada* Gray, *Ann. Mag. Nat. Hist.* [Ser. 1], **1** : 586.

Common Name : Soft - furred Metad.

Locality: Suitable habitat in the Pench Tiger Reserve.

Habit : Fossorial.

Habitat : The species inhabits mostly in irrigated crop fields, grasslands, sometimes found in heavy scrub surrounded by forest (Agrawal, 2000).

Distribution : Throughout India except northeast (Agrawal, 2000). *Elsewhere* : Sri Lanka, Nepal, Pakistan.

Conservation Status : *IUCN* : Least Concern; *IWPA*: Schedule V (Vermin).

Genus ***Mus*** Linnaeus, 1758

14. ***Mus booduga*** (Gray, 1837)

1837. *Leggada booduga* Gray, *Charlesworth's Mag. nat. Hist*., **1**: 586.

Common Name : Indian Field Mouse

Locality: Bodanala, Jamtara in Pench Tiger Reserve; Sept., Dec., 2001.

Habit: Fossorial.

Habitat: Grasslands, crop fields, forest fringes.

Distribution: Throughout India. *Elsewhere*: Bangladesh, South Nepal, Central Myanmar, Pakistan and Sri Lanka (Musser and Carleton, 2005).

Conservation Status : *IUCN* : Least Concern; *IWPA*: Schedule V (Vermin).

15. ***Mus musculus castaneus*** Waterhouse, 1843

1843. *Mus castaneus* Waterhouse, *Ann.Mag. nat. Hist..,* 12: 134.

Common Name: House Mouse.

Locality: Commonly sighted near to human habitation within Pench Tiger Reserve.

Habit : Terrestrial, fossorial and found in all habitats.

Habitat: A common house mouse causing extensive damage to the properties.

Distribution: Throughout India. *Elsewhere* : Nepal, Sri Lanka, China (Yunnan) and Southeast Asia (Agrawal, 2000).

Conservation Status: IUCN: Least concern (For *Mus musculus*), *IWPA*: Schedule V (Vermin).

16. ***Mus phillipsi*** Wroughton, 1912

1912. *Mus phillipsi* Wroughton, *J. Bombay nat. Hist. Soc.*, **21** : 772.

Common Name : Wroughton's Small Spiny Mouse.

Locality: Pradhan (2004) reported from Pench National Park, Maharashtra region.

Habit : Terrestrial, fossorial and nocturnal in habit.

Habitat: Generally found in rocky habitat.

Distribution : Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh (Nimar area (Burhanpur, Khandwa & Khargone Dist.), Rajasthan, Tamil Nadu (Agrawal, 2000); *Elsewhere* : None. *Conservation Status* : *IUCN* : Least Concern; IWPA: Schedule V (Vermin).

Genus ***Rattus*** Fischer, 1803

17. ***Rattus rattus rufescence*** (Gray, 1837)

1837. *Mus rufescens* Gray, *Ann. Mag. Nat. Hist.* **1**: 585.

Common Name : House Rat, Roof Rat

Locality: This species is known to occur in P.T.R.

Habit: Terrestrial.

Habitat: Ubiquitous in and around human habitation, scrub, secondary forests, mangrove swamp.

Conservation Status: IUCN : Least concern (For *Rattus rattus*), IWPA: Schedule V (Vermin).

Genus ***Vandeleuria*** Gray, 1842

18. ***Vandeleuria oleracea oleracea*** (Bennett, 1832)

1832. *Mus oleraceus* Bennett, *Proc. Zool. Soc. Lond.*, **1832:** 121.

Common Name: Indomalayan Vandeleuria, Long-tailed Tree Mouse.

Locality: Pradhan (2004) reported this species from Pench National Park, Maharashtra region, hence its occurrence in PTR, MP is not ruled out.

Habit: Terrestrial, arboreal and nocturnal.

Habitat: Trees and shrubs in forest are its natural haunt.

Distribution: Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu (Agrawal, 2000). *Elsewhere* : Sri Lanka.

Conservation Status: IUCN: Least concern; IWPA.

Suborder HYSTRICOMORPHA

Infraorder HYSTRICOGNATHI

Family HYSTRICIDAE

Genus ***Hystrix*** Linnaeus, 1758

19. ***Hystrix indica*** Kerr, 1792

1792. *Hystrix cristatus* var. *indica* Kerr, *Anim. Kingd.*: 213.

Common Name: Indian Porcupine

Locality: Alikatta, Chhindimatta in Pench Tiger Reserve; June, July, 2001.

Habit: Fossorial.

Habitat: Rocky hillsides and also any other open land and forest.

Distribution: Throughout India. *Elsewhere*: Nepal, Pakistan, Sri Lanka, west to Israel and north to Turkistan.

Conservation Status: IUCN: Least concern; IWPA: Schedule IV.

Order LAGOMORPHA

Family LEPORIDAE

Genus ***Lepus*** Linnaeus, 1758

20. ***Lepus nigricolis*** Cuvier, 1823

1823. *Lepus nigricollis* Cuvier, *Dict. Sci. Nat*., **26**: 307.

Common name : Blacknaped Hare.

Locality: Chhediaghat, Baghdeo, Bodanala, Kumbhpani, Alikatta, Chhindimatta; June-Dec., 2001.

Habit: Herbivorous.

Habitat: All habitats except high altitudes.

Distribution: Throughout India except in high altitudes. *Elsewhere*: Bangladesh, Nepal, Pakistan, and Sri Lanka.

Conservation Status: IUCN: Least concern, IWPA: Schedule IV.

Order **EULIPOTYPHLA**

Family SORICIDAE

Subfamily CROCIDURINAE

Genus ***Suncus*** Ehrenberg, 1832

21. ***Suncus etruscus*** (Savi, 1822)

1822. *Sorex etruscus* Savi, *Nuovo Giorn. De Letterati*, Pisa, **1** :60.

Common Name : Savi's Pigmy Shrew

Locality: Talmale (2017) reported this species from Chhindwada district, Madhya Pradesh which is adjoining the area of Pench Tiger Reserve.

Habit : Nocturnal, terrestrial and semi-fossorial.

Habitat : Lives in multiparous habitats on plains and high altitudes, also inhabits cultivated fields, forests and moist soil along the riverbanks.

Distribution : Throughout India. *Elsewhere* : S Europe and N Africa; Arabian Peninsula and Asia Minor to Iraq, Turkemenistan, Afghanistan, Pakistan, Nepal, Bhutan, Myanmar, Thailand, Laos, Vietnam and Yunnan (China) and Sri Lanka (Hutterer, 2005).

Conservation status : *IUCN* : Least Concern.

22. ***Suncus murinus*** (Linnaeus, 1766)

1766. *Sorex murinus* Linn., *Syst. Nat*., 12th ed., 1: 74.

Common name : House Shrew.

Locality: This species is known to occur in P.T.R.

Habit: Nocturnal.

Habitat: Occasionally in all sorts of habitats, particularly near human dwellings, forests, crop fields.

Distribution: Throughout India. *Elsewhere*: Africa, Asia, Europe, North America.

Conservation Status: IUCN: Least concern.

Order CHIROPTERA

Suborder MEGACHIROPTERA

Family PTEROPODIDAE

Genus ***Cynopterus*** Cuvier, 1824

23. ***Cynopterus sphinx sphinx*** (Vahl, 1797)

1797. *Vespertilio sphinx* (Vahl) *Skr. Nat. Selsk* Copenhagen **4** (1): 123.

Common Name: Short-nosed Fruit Bat.

Localty: This species is known to occur in P.T.R.

Habit : Terrestrial and arboreal.

Habitat: preferring to live in small colonies on fruit bearing trees close to forests.

Distribution: Indian sub-continent (Bates and Harrison, 1997).

Conservation Status: IUCN): Least Concern; IWPA: Schedule V (Vermin).

Genus ***Pteropus*** Brisson, 1762

24. ***Pteropus giganteus giganteus*** (Brunnich, 1782)

1782. *Vespertilio gigantea* Brunnich, *Dyrenes Historie*, **1**: 45.

Common Name : Indian Flying Fox

Locality: Banskheda, Mahadeoghat, Ghat Pindari in Pench Tiger Reserve; Aug., Nov., 2001.

Habit: Arboreal, frugivorous. Diurnal roost is always quite far away from the foraging ground.

Habitat: Forests and swamps with a large body of water supply.

Distribution: Throughout India. *Elsewhere*: South Asia.

Conservation Status: IUCN: Least Concern; IWPA: Schedule V (Vermin); CITES: Appendix II.

Genus ***Rousettus*** Gray, 1821

25. ***Rousettus leschenaulti leschenaulti*** (Desmarest, 1820)

1820. *Pteropus leschenaulti* (Desmarest) *Encyl. Meth. Mammal*. **1:** 110.

Common Name: Rousettes or Indian fulvus fruit bat.

Locality: Pradhan (2004) reported this species from Pench Tiger Reserve.

Habit : Terrestrial, arboreal, forming gregarious noisy roosts.

Habitat: Preferring to live in caves and man-made constructions.

Distribution: Peninsular India (Bates and Harrison, 1997). *Elsewhere* : Sri Lanka, Pakistan to Vietnam and S China, Peninsular Malaysia, Sumatra, Java, Bali and Mentawai Islands (Indonesia) (Simmons, 2005).

Conservation Status: IUCN: Least Concern; Indian Wildlife (Protection) Act (1972) (as amended upto 2006): Schedule V (Vermin).

Suborder MICROCHIROPTERA

Family HIPPOSIDERIDAE

Genus ***Hipposideros*** Gray, 1831

26. ***Hipposideros speoris speoris*** (Schneider,)

1800. *Vespertilio speoris* Schneider, *In Schreber, J. C. D. Die Saugerthiere.* : 59 b.

Common name : Schneider's Leaf-nosed bat.

Locality : Pradhan (2005) reported this species from Pench river, Pench National Park (Maharashtra).

Habit : This subspecies is known to occur in a variety of biotopes ranging from dry, flat country to forested hills.. It feeds on mosquitoes, flies, beetles etc. (Bates and Harrison, 1997).

Habitat: Its favourable diurnal roost includes crevices in hills, caves, caverns, tunnels, dilapidated buildings, temples etc.

Distribution : Throughout India. Elsewhere : Sri Lanka (Bates and Harrison, 1997).

Conservation Status : *IUCN* : Least Concern.

Family MEGADERMATIDAE

Genus ***Megaderma*** E. Geoffroy, 1810

27. ***Megaderma lyra lyra*** Geoffroy, 1810

1810. *Megaderma lyra* E. Geoffroy. *Ann. Mag. Hist.*

Nat. Paris, 15: 190.

Common Name: Greater false vampire bat.

Locality: Pradhan (2004) reported this species from Pipariya and Ranidoh in Pench National Park, Maharashtra, its occurrence in Pench Tiger Reserve, MP is not ruled out.

Habit : Colonial in habit.

Habitat: Inhabiting old ruins, houses, temples wells etc.

Distribution: Throughout India (Bates and Harrison, 1997). *Elsewhere* : Afghanistan to southern China, south to Pakistan, Sri Lanka and Malaysia (Bates and Harrison, 1997).

Conservation Status: IUCN: Least Concern.

Family VESPERTILIONIDAE

Subfamily VESPERTILIONINAE

Genus ***Pipistrellus*** Kaup,1829

28. ***Pipistrellus coromandra*** (Gray, 1838)

1838. *Scotophilus coromandra* Gray, *Mag. Zool. Bot*., **2**: 498.

Common name : Indian Pipistrelle

Locality: This species is known to occur in P.T.R.

Habit: Arboreal.

Habitat: Crevices of buildings, bark of trees.

Distribution: Throughout India except Gujarat, Rajasthan, Jammu & Kashmir. *Elsewhere*: Afghanistan, Pakistan, Sri Lanka.

Conservation status : *IUCN* : Least Concern.

Order PHOLIDOTA

Family MANIDAE

Genus ***Manis*** Linnaeus, 1758

29. ***Manis crassicaudata*** Gray, 1827

1827. *Manis crassicaudata* Gray, *In Griffith's Cuvier Anim. Kingd*., **5**: 282.

Common name : Indian Pangolin

Locality: This species is known to occur in P.T.R.

Habit: Terrestrial, nocturnal, insectivorous.

Habitat: Scrub, urban cultivation, dry and moist forests except true desert.

Distribution: Throughout India except North-eastern region, desert and the Himalayas. *Elsewhere*: Bangladesh, Pakistan.

Conservation Status: IUCN: Endangered, IWPA: Schedule I Part: I, CITES: Appendix: I.

Order CARNIVORA

Suborder FELIFORMIA

Family FELIDAE

Subfamily FELINAE

Genus ***Felis*** Linnaeus, 1758

30. ***Felis chaus kutas*** Pearson, 1832

1832. *Felis kutas* Pearson, *J. Asiat. Soc. Beng*., **1**: 75.

Common name : Jungle Cat.

Locality: Dongargaon, Alikatta, Bodanala; July, Nov., Dec., 2001.

Habit: Crepescular, nocturnal, terrestrial,

Habitat: Open forest, grassland, dry deciduous and evergreen forest.

Distribution: Throughout India. *Elsewhere*: Africa, Indo-China, Myanmar, South-west Asia, Sri Lanka, Vietnam.

Conservation Status: IUCN: Least Concern; IWPA: Schedule II Part II; CITES : Apendix II.

Genus ***Prionailurus*** Severtzov, 1858

31. ***Prionailurus bengalensis*** (Kerr, 1792)

1792. *Felis bengalensis* Kerr, *Anim. Kingd*.: 151.

Common name : Leopard Cat.

Locality: This species is known to occur in P.T.R.

Habit: Terrestrial, semi-arboreal.

Habitat: Grasslands, scrub, wet and moist forests.

Distribution: Practically throughout India excluding hot and cold desert Alfred *et. al.* (2006). *Elsewhere* : Afghanistan, Bangladesh, Cambodia, China, Indonesia, Laos, Myanmar, Malaysia, Nepal, North Koria, Pakistan, Philippines, Russia (Far East),

Taiwan, Thailand, South Korea, and Vietnam.

Conservation Status : IUCN: Least Concern; IWPA: Schedule I Part I, CITES: Appendix: I.

Subfamily PANTHERINAE

Genus ***Panthera*** Oken, 1816

32. ***Panthera pardus fusca*** (Meyer, 1794)

1794. *Panthera fusca* Meyer, *Zool. Ann*., **1**: 394.

Common name : Leopard

Locality: Khamreet camp in Pench Tiger Reserve; July, 2001.

Habit: Terrestrial, semi-arboreal, carnivorous.

Habitat: Forests, scrub-jungle, open country.

Distribution: Throughout India. *Elsewhere*: Sri Lanka, Nepal, Africa.

Conservation Status: IUCN: Vulnerable, IWPA: Schedule I Part I, CITES: Appendix I.

33. ***Panthera tigris tigris*** (Linnaeus, 1758)

1758. *Felis tigris* Linn., *Syst. Nat*., **10**th ed., 1: 41.

Common name : Tiger

Locality: Chhindimatta in Pench Tiger Reserve; July, 2001.

Habit: Terrestrial, carnivorous.

Habitat: Dense forest, thorny, semi-evergreen, evergreen, mangroves, grassland.

Distribution: All over India except Haryana, Himachal Pradesh, Jammu & Kashmir and Punjab. *Elsewhere*: Bangladesh, Bhutan, Nepal, and Myanmar.

Conservation Status: IUCN: Endangered; IWPA: Schedule I Part I, CITES: Appendix: I.

Family VIVERRIDAE

Subfamily PARADOXURINAE

Genus ***Paradoxurus*** Cuvier, 1821

34. ***Paradoxurus hermaphroditus*** (Pallas, 1777)

1777. *Viverra hermaphroditus* Pallas, *In Schreber*, *Saugeth*, **3**: 426.

Common name : Common Palm Civet, Toddy Cat

Locality: Gandadeonala in Pench Tiger Reserve; Nov., 2001.

Habit: Carnivorous.

Habitat: Tropical forests, rural and urban areas except high altitudes.

Distribution: Peninsular India. *Elsewhere*: South and South-east Asia.

Conservation Status: IUCN: Least Concern; IWPA: Schedule II Part II, CITES: Appendix III (India).

Subfamily VIVERRINAE

35. ***Viverricula indica*** (E. Geoffroy, 1803)

1817. *Viverra indica* Desmarest, *Nouv. Dict. Nat. Hist*., **7**: 170.

Common name : Small Indian Civet.

Locality: Between Turia to Kohka in Pench Tiger Reserve; June, 2001.

Habit: Terrestrial, semi-arboreal, nocturnal.

Habitat: All types of forests, human habitats, except deserts and high altitudes.

Distribution: All over India except deserts and high altitudes. *Elsewhere*: South Asia and South-east Asia.

Conservation Status: IUCN: Least Concern; IWPA: Schedule II Part II, CITES: Appendix III (India).

Family HERPESTIDAE

Subfamily HERPESTINAE

Genus ***Herpestes*** Illiger, 1811

36. ***Herpestes edwardsii*** (Geoffroy, 1818)

1818. *Herpestes edwardsi* Geoffroy, *D'dscr. Egypte*, **2**: 139.

Common name : Grey Mongoose.

Locality: Alikatta, Shankarvan, Sitakassa; July, Sept., Nov., 2001.

Habit: Terrestrial, diurnal/nocturnal.

Habitat: Open scrub, cultivation, rocky patches, forest edges.

Distribution: Himalayan foothills to Cape Camorin

except in moist forests and true deserts. *Elsewhere*: Iran, Iraq, Sri Lanka.

Conservation Status: IUCN: Least Concern; IWPA: Schedule II Part II; CITES: Appendix III (India).

37. ***Herpestes smithii*** Gray, 1837

1837. *Herpestes smithii* Gray, *Charlesworth's Mag. Nat. Hist*., **1**: 578.

Common name : Ruddy Mongoose.

Locality: This species is known to occur in P.T.R.

Habit: Terrestrial, diurnal/nocturnal.

Habitat: Dry and moist forests.

Distribution: Peninsular India. *Elsewhere*: Sri Lanka.

Conservation Status: IUCN: Least Concern; IWPA: Schedule II Part II; CITES: Appendix III (India).

Family HYAENIDAE

Genus ***Hyaena*** Brunnich, 1771

38. ***Hyaena hyaena*** (Linnaeus, 1758)

1758. *Canis hyaena* Linn., *Syst. Nat*., **10**th ed., 1: 40.

Common name : Striped Hyaena

Locality: This species is known to occur in P.T.R.

Habit: Terrestrial, carnivorous.

Habitat: Dry thorn, semi-urban, rare in forests but common in scrubs.

Distribution: Throughout India up to desert (sub-peninsular India). *Elsewhere*: North Africa, South-west Asia.

Conservation Status: IUCN: Near Threatened; IWPA: Schedule III.

Suborder CANIFORMIA

Family CANIDAE

Genus ***Canis*** Linnaeus,1758

39. ***Canis aureus*** Linnaeus, 1758

1758. *Canis aureus* Linn., *Syst. Nat*., 10th ed., 1: 40.

Common name : Asiatic Jackal

Locality: Tikadi, Turia, Alikatta, Kalapahad, Chhindimatta,Totladoh, Turia gate, Pyorthadi, Satosa, Khamreet in Pench Tiger Reserve; June, July, Aug., 2001.

Habit: Terrestrial, carnivorous, mainly nocturnal and crepuscular.

Habitat: Forest, scrub, desert, near villages.

Distribution: Throughout India. *Elsewhere*: North and east Africa, south to Senegal, Nigeria and Tanzania; south-west Asia; south-east Europe; Trans-caucasia; central Asia; Iran; Afghanistan; southern Asia (including Sri Lanka) to Thailand.

Conservation Status: IUCN: Least Concern; IWPA: Schedule II Part II; CITES: Appendix III (India).

40. ***Canis lupus pallipes*** Sykes, 1827

1831. *Canis pallipes* Sykes, *Proc. zool. Soc. Lond*.: 101.

Common name : Indian Wolf

Locality: This species is known to occur in P.T.R.

Habit: Terrestrial, carnivorous.

Habitat: Deciduous and semi-arid areas of forests.

Distribution: Throughout India except in Tamil Nadu, Kerala and North-eastern India. *Elsewhere*: Iran, Iraq, Pakistan.

Copnservation Status: IUCN: Least Concern; IWPA: Schedule I Part I; CITES: Appendix I.

Genus ***Cuon*** Hodgson, 1838

41. ***Cuon alpinus*** (Pallas, 1811)

1811. *Canis alpinus* Pallas, *Zoogr. Ross Asiat*., **1**: 34.

Common name : Wild Dog

Locality: Baghdeo, Alikatta, Bhimalkonda pond, Pyorthadi; June, July, 2001.

Habit: Terrestrial, carnivorous.

Habitat: All forest areas except mangroves.

Distribution: Endemic to India. Found in the region south of Ganges.

Conservation Status: IUCN: Endangered; IWPA: Schedule II Part I *CITES*: Appendix: II.

Genus ***Vulpes*** Frisch, 1775

42. ***Vulpes bengalensis*** (Shaw)

1800. *Canis bengalensis* Shaw, *Gen. Zool.*, **1**, 2: 330.

Common name : Bengal Fox.

Locality: Kokiwada, Khamarpani, Mahadeoghat, Alikatta; June-Dec., 2001.

Habit: Terrestrial, carnivorous.

Habitat: Deciduous, evergreen, mixed forests.

Distribution: Throughout India. *Elsewhere*: Bangladesh, Nepal.

Conservation Status: IUCN: Least Concern; IWPA: Schedule II Part II, CITES: Appendix III (India).

Family URSIDAE

Genus ***Melursus*** Meyer, 1793

43. ***Melursus ursinus*** (Shaw, 1791)

1791. *Bradypus ursinus* Shaw, *Nat. Misc.*, **2**: pls. 58-59.

Common name : Sloth Bear

Locality: Mahadeoghat in Pench Tiger Reserve; Nov., 2001.

Habit: Terrestrial, arboreal.

Habitat: Forests, grasslands, hill tops.

Distribution : Throughout India. *Elsewhere*: Nepal, Sri Lanka.

Conservation Status: IUCN : Vulnerable; IWPA: Schedule I Part I, CITES: Appendix: I.

Order ARTIODACTYLA

Family SUIDAE

Genus ***Sus*** Linnaeus, 1758

44. *Sus scrofa cristatus* Wagner, 1839

1839. *Sus cristatus* Wagner, *Munch. Gelehrt. Anz.*, **9**: 435.

Common name : Wild Boar.

Locality: Chhindimatta, Alikatta, Kalapahad, Baghdeo, Sitaghat, Turiagate, Satosha, Khamreet camp in Pench Tiger Reserve; June, July, Dec., 2001.

Habit: Terrestrial, omnivorous.

Habitat: Burrows under bushes.

Distribution: Throughout India. *Elsewhere*: Europe, South Asia.

Conservation Status: IUCN: Least Concern; IWPA: Schedule III.

Family CERVIDAE

Subfamily CERVINAE

Genus ***Axis*** Smith, 1827

45. ***Axis axis*** (Erxleben, 1777)

1777. *Cervus axis* Erxleben, *Syst. Regn. Anim.*: 312.

Common name : Chital, Spotted Deer

Locality: Karmajhiri, Jamtara, Gumtara ranges in Pench Tiger Reserve; June-Dec., 2001.

Habit: Terrestrial, herbivorous.

Habitat: Moist and dry deciduous forests.

Distribution: Throughout India. *Elsewhere*: Sri Lanka.

Conservation Status: IUCN: Least Concern; IWPA: Schedule III.

Genus ***Muntiacus*** Rafinesque, 1815

46. ***Muntiacus muntjak*** (Zimmermann, 1780)

1780. *Cervus muntjak* Zimmermann, *Geogr. Gesch.*, 2: 131.

Common name : Barking Deer

Locality: As per the records this species is known to occur in P.T.R.; June-Dec., 2001.

Habit: Terrestrial, herbivorous.

Habitat: Any forest except mangroves, moist and mixed deciduous forest and desert.

Distribution: Throughout India. *Elsewhere*: China, South-east Asia.

Conservation Status: IUCN: Least Concern; IWPA: Schedule III.

Genus ***Rusa*** Smith, 1827

47. ***Rusa unicolor*** (Kerr, 1792)

1792. *Cervus axis unicolor* Kerr, *Anim. Kingd.*: 300.

2005. *Rusa unicolor*: Grubb, P., Artiodactyla

In: *Mammal species of the World* 3rd Ed. (Ed. Wilson & Reeder)

Vol. I: 670-671.

Common name : Sambar

Locality: Chhediaghat, Kalapahad, Chhindimatta, Alikatta, Turia, Baghdeo, Khawasa, Pyorthadi, Sitaghat; June-Dec., 2001.

Habit: Terrestrial, herbivorous.

Habitat: Thickly wooded forest.

Distribution: Throughout India. *Elsewhere*: Sri Lanka, South-east Asia.

Conservation Status: IUCN: Vulnerable; IWPA: Schedule III.

Family BOVIDAE

Subfamily ANTILOPINAE

Genus ***Gazella*** de Blainville, 1816

48. ***Gazella bennettii*** (Sykes, 1831)

1831. *Gazella bennetti* Sykes, *Proc. zool. Soc. Lond.*, 1830-31: 104.

Common name : Indian Gazelle, Chinkara

Locality: Puntra in Pench Tiger Reserve; Sept., 2001.

Habit: Terrestrial, herbivorous.

Habitat: Dry deciduous, thorny forest and desert.

Distribution: India: *Elsewhere*: Iran, Pakistan.

Conservation Status: IUCN: Least Concern; IWPA: Schedule I Part I.

Subfamily BOVINAE

Genus ***Boselaphus*** Blainville, 1816

49. ***Boselaphus tragocamelus*** (Pallas, 1766)

1766. *Antelope tragocamelus* Pallas, *Misc. Zool.*: 5.

Common name : Nilgai, Blue Bull

Locality: Pyorthadi, Alikatta, Kalapahad, Bodanala, Khamreet camp, Chhindimatta in Pench Tiger Reserve; June-Dec., 2001.

Habit: Terrestrial, herbivorous.

Habitat: Dry deciduous and thorn forest.

Distribution: India: Central, North, North-eastern, North-western India up to Andhra Pradesh. *Elsewhere*: Pakistan.

Conservation Status: IUCN: Least Concern; IWPA: Schedule III.

Genus ***Tetracerus*** Leach, 1825

50. ***Tetracerus quadricornis*** (Blainville, 1816)

1816. *Cerophorus* (*Cervicapra*) *quadricornis* Blainville, *Bull. Soc. Philom. Paris*: 75, 78.

Common name : Four Horned Antelope

Locality: Jamtara in Pench Tiger Reserve; Nov., 2001.

Habit: Terrestrial, herbivorous.

Habitat: Well wooded, watered, undulating dry deciduous forest, transition zone between scrub and dry deciduous forests.

Distribution: Throughout India except the North-east. *Elsewhere*: Nepal.

Conervation Status: IUCN : Vulnerable; IWPA: Schedule I Part I.

SUMMARY

As many as 50 mammalian species belong to 42 genera 21 families and 9 orders have been recorded from PTR (M.P.). Most of these species prefer to inhabit the riparian habitat. One of the most spectacular mammal species is Gaur (*Bos gaurus*). It has the distinction of being world's one of the largest bovines. Indian Gazelle or Chinkara (*Gazella bennettii*) is another attractive species that is vulnerable in conservation status since it is hunted for food and furred skin. Four-horned antelope or Chowsingha (*Tetraceros quadricornis*) is an uncommon species. Unlike Chowsingha, Nilgai or Blue Bull (*Boselaphus tragocamelus*) is quite abundant in population. Nilgai prefers to live in open areas, scrubs and habitats close to cultivation, but avoids dense forests and are seen in herds of 4-15 individuals. Three types of deer species, viz.,

Cheetal, Sambar and Barking Deer are found in PTR. Wild Boar (*Sus scrofa*) is an extremely agile animal with an excellent sense of smell. It is quite fond of wallowing in the mud. Its den is a shelter in a thicket or grass.

The carnivores of PTR are represented by highly threatened species like Tiger and Leopard. Other threatened species like Leopard Cat, wolf, Bengal Fox, Wild Dog, Striped Hyaena, Small Indian Civet, Sloth Bear, etc., are also known to occur in the region.

Primates are represented by the two species: Rhesus Macaque (*Macaca mulatta*) and Hanuman or Common Langur (*Semnopithecus entellus*), which are abundant in this region.

Indian Pangolin (*Manis crassicaudata*) looks like an unusual animal due to its armour of large overlapping plates or scutes. They look more like a reptile than a mammal.

The bats are represented by some of the species like Indian Flying Fox (*Pteropus giganteus*) and Indian Pipistrelle (*Pipistrellus coromandra*).

Insectivores are represented by Common or House Shrew (*Suncus murinus*) and Pygmy Shrew (*Suncus etruscus*), while rodents by Large Bandicoot Rat (*Bandicota indica*), Indian Bush Rat (*Golunda ellioti*), Little Indian Field Mouse (*Mus booduga*), Blanford's Rat (*Madromys blanfordi*), House Rat (*Rattus rattus rufescens*), Indian Palm Squirrel (*Funambulus palmarum robertsoni*), Northern Palm Squirrel (*Funambulus pennantii*), etc. from this region. These small mammals are abundant in number. However, large sized rodent species like Crested Porcupine (*Hystrix indica*), and Flying Squirrel (*Petaurista philippensis*) are less common. Lagomorpha are represented by a single species of hare, viz., *Lepus nigricollis.*

Almost all the mammalian species found in Pench Tiger Reserve (M.P.) are dependent on its wetland and riparian habitats in one way or another for food, shelter and water. The wetland supports a rich diversity of fauna and hence it is of great significance in the conservation of biodiversity.

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STUDIES ON THE EFFECT OF INTERGRATED NUTRIENT MANAGEMENT ONVEGETATIVE GROWTH, OF RADISH (RAPHANUS SATIVAS L.) CV. PUSA RESHMI

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ABSTRACT

The present field experiment entitled "Effect of intergrated nutrient management on growth, yield and quality of radish (*Raphanus sativas L.*) cv. Pusa Reshmi" was carried out during rabi season of the year 2023-2024 at Kulbhaskar Ashram Post Graduate College, Prayagraj (U.P.). The result and conclusion of the about experiment are briefly explain here. The experiment was laid out in a randomized block design with 3 replication and 8 treatments viz. T_1 Control, T_2 100% Rdf (50:100:50) N:P:K, T_3 100% Varmicompost, T_4 100% Fram yard manure + 50% Neem cake, T_5 100% Poultry manure+ 50% Neem cake + Azospillum, T_6 25% Rdf+ 50% Neem cake + 50% Poultry manure, T_7 50% Rdf + 25% Neem cake + 25% Varmicompost + 25% fym + Azospirillum, T_8 75% Rdf + 25% (Varmicompost + Neem cake + Fym +P.m.) + Azospirillium.

Keywords : *INM, radish, growth, leaf area.*

INTRODUCTION

The radish (Raphanus sativas L.), which has chromosome number 2n=18, is a member of the Cruciferae family. Herbs like radishes can be annual or biennial. It has a handful of leaves that, depending on the variety, can range in size from 10 to 54 cm. It originated in Asia. Temperate and tropical climates are the ideal for growing this root vegetable. The leaves and roots that are used are consumed raw or cooked in salads. The saprophytic system's self-incompatibility makes it a cross-pollinated vegetable. Radishes are grown for their young, delicate fusiform root.

Integrated Nutrient Management employs poultry manure, vermicomposting, and organic matter such as Fym when needed. Because it is high in organic matter, fodder is the most widely used manure to add extra nutrition to crops.

The soil, climate, and type of soil—clay, loamy, clay, etc.—all affect the growth and development of radish plants. For best results, many varieties require different types of soil and climate. Given that India has some of the best climates in the world—temperate, subtropical, tropical, coastal, bright, and hot—using organic, inorganic, and bio fertilizers to produce radish in the best possible way is crucial for sustainable production.

The application of organic manure greatly increased the plant's height, number of leaves, root length, and root diameter. These effects were greatest when vermicompost and poultry manure were combined, with a percentage of each on the growth and yield of Japanese white radish. Given the rising cost of fertilizer and its role in degrading soil

and water quality, it is necessary to look for alternative, less expensive sources, such as organic manures, in order to partially meet crop requirements. Against this backdrop, research was eventually conducted to determine how inorganic and bio fertilizers affected crop growth (Kumar et al. 2004). Radish is primarily a cool-season crop from an agronomic standpoint, however Asian varieties can withstand higher temperatures than temperate for alternative and cheaper source like organic manures so as to partially the crop requirement and ultimately with this background in investigation was done to evaluate the influence of inorganic fertilizers and bio- fertilizers on the growth (Kumar et al. 2004). from the agronomical approached Radish is pre dominantly a cool season crop but Asiatic types can tolerate high temperatures opposed to temperate varieties. In the cooler temperature range of 10-15 C0, the roots develop their best flavor, texture, and size. The crop that is grown in the winter season from mid-September to early-October is grown during the main season. In April and June, summer season crops are grown. European type seeds are sown in September–March, while Asian type seeds are sown from August–January. In south Indian hills, April to June is the best time to sow, and in plains, October to September. On one side of the ridges, the acetic type can be continuously sown at a spacing of 45 cm, with a plant-to-plant distance of 6-8 cm.

Organic farming improves soil texture and increases environmental sensitivity. It also changes consumer dietary preferences, so organic food products and supplements should be taken into account. The purpose of this study was to examine the effects of different organic nutrient sources on radish yield and quality parameters. The agro climatic zone of middle Uttar Pradesh does not have access to research data on this crop.

MATERIALS AND METHODS

A field experiment was conducted during rabi 2023-2024 to study the "Effect of intergrated nutrient management on growth, yield and quality of radish (*Raphanus sativas L.*) cv. Pusa Reshmi". The details of material and methods used and the experimental technique adopted during the course of investigation are described below. The experiment was laid out at the college farm kulbhaskar Ashram Post College, Prayagraj (U.P.). The experiment was laid out in randomized block design with 3 replication and 8 treatments viz. T_1 Control, T_2 100% Rdf (80:40:80) N:P:K, T_3 100% Varmicompost, T_4 100% Fram yard manure + 50% Neem cake, T_5 100% Poultry manure+ 50% Neem cake + Azospillum, T_6 25% Rdf+ 50% Neem cake + 50% Poultry manure, T_7 50% Rdf + 25% Neem cake + 25% Varmicompost + 25% fym + Azospirillum, T_8 75% Rdf + 25% (Varmicompost + Neem cake + Fym +P.m.) + Azospirillium. Total number of plots: 24, Row to Row distance 45 cm, Plant to Plant 8 cm, Net plot size 20 X 15 feet.

The present experiment was laid out in the field of vegetable research farm, Department of Horticulture, Kulbhaskar Ashram Post Graduate College, Prayagraj during rabi season 2023-2024.

Prayagraj (Allahabad) is located between $24^{O}47$ N and 25^{O} N latitudes and between $81^{O}19$ E and $82^{O}21$ E longtitudes. Prayagraj lies in the southern part of the state in genetic plain and adjoining the Vindhyan plateau of india at an elevation of 98 meters.

RESULTS AND DISCUSSION

Plant height

At 15 days after sowing, the significantly maximum (15.65 cm) plant height was recorded in T7 (50% RDF + 25% (FYM + poultry manure + vermicompost + neem cake) + Azospirillum), followed by T8 (75% RDF+25% (FYM+ poultry manure + vermicompost + neem cake) +

Azospirillum) (15.35 cm), T4 (Vermicompost +Neem cake 50% +Azospirillum) (14.42 cm) and which were at par with each other. While, the minimum (12.62 cm) plant height was observed in treatment T1 (Control). As regards to 30 days after sowing, the significantly maximum(32.83 cm) plant height was recorded in T7 (50% RDF+25% (FYM + Poultry manure + Vermicompost + Neem cake) +Azospirillum) followed by T8 (75% RDF+25% (FYM + Poultry manure + Vermicompost + Neem cake) +Azospirillum) (32.19 cm), T4 (100% Vermicompost 4t/ha + 50%Neem cake+Azospirillum) (30.55 cm), Ti (Neem cake 2.5t/ha + FYM 20t/ha + PSB 4kg/ha + Azotobactor 4kg/ha) (32.71 cm) and which were at Par with each other. While, the minimum (30.24 cm) plant height was observed in treatment T1(Control). Findings are in conformity with the findings of Bodkhe and Mahorkar 2010; Sahramani et al 2011 and Muhammed et al 2016.

Table - 1 : Effect of integrated nutrient management of plant height of radish at 15, 30, 45 DAS.

Treatment mark	Treatment	Plant height (cm.)		
		15 DAS	30 DAS	45 DAS
T_1	Control	12.62	30.36	32.52
T_2	100% RDF (50:100:50)	13.65	31.00	33.22
T_3	100% Vermicompost	12.74	28.49	30.49
T_4	100% FYM + 50% Neem cake	14.42	31.13	22.35
T_5	100% Vermicompost+ 50% Neem cake + Azospirillum	12.67	30.55	32.73
T_6	25% RDF + 50% Poultry manure + 50% Neem cake	12.85	29.79	31.92
T_7	50% RDF + 25% Neem cake + 25% Vermicompost + 25% FYM + Azospirllum	15.64	32.83	35.17
T_8	75% RDF + 25%(Vermicompost + Neem cake + FYM + Poultry manure) +Azospirillum	15.35	32.19	34..49

C.D. 5% - 0.7082;SE(m)- 0.2334;SE(d)- 0.9829;
C.V- 1.565

Number of leaves

Number of leaves plant increased significantly with the increased crop growth period. At 1Sdays after sowing, the significantly maximum(07.34) leaves plant was ncorded in T7 (50% RDF+50% (FYM + Poultry manure + Vermicompost + Neem cake) Azotospirillum) at par with T8 (75% RDF + 25% (FYM + Poultry manure + Vermicompost + Neem cake) + Azospirillum) (6.42), while, the minimum (5.72) leaves plant was observed in treatment T1 (Control). In case of 30 DAS, the significantly maximum (11.75) leaves plant was recorded in T7 (50% RDF + 50% (FYM + Poultry manure + Vermicompost + Neem cake) +azospirillum) at par with T8 (75% RDF + 25% (FYM+ poultry manure + vermicompost + neem cake) + azospirillum) (11.38) and T4 (Neem cake 2t/ha + Vermicompost 4t/ha + azosprillum) (9.93), while, the minimum (10.02) leaves plant was observed in treatment T1 (Control).

At 45 DAS, significantly maximum (13.42) leaves plant was observed under treatment T7 (50% RDF+25% (FYM + Poultry manure + Vermicompost + Neem cake) + Azospirillum) 13.88 followed by T8 (75% RDF + 25% (FYM + Poultry manure + Vermicompost + Neem cake) + Azospirillum) (13.42) and T4 (Neem cake 50+100% varmi compost) (12.64) as compared to other treatments. However, the minimum (12.03 leaves plant) was observed in treatment T1 (Control).

Findings are in conformity with the findings of Kumar et al 2014; Khalid et al 2015 and Singh et al 2016.

Table - 2 : Effect of integrated nutrient management of number of leaves of radish at 15, 30, 45 DAS.

Treatment mark	Treatment	Number of leaves plants (cm.)		
		15 DAS	30 DAS	45 DAS
T_1	Control	5.72	9.42	12.03
T_2	100% RDF (50:100:50)	6.08	10.02	12.43
T_3	100% Vermicompost	5.84	9.54	12.37
T_4	100% FYM + 50% Neem cake	6.35	11.08	12.64
T_5	100% Vermicompost+ 50% Neem cake + Azospirillum	6.04	9.93	12.29
T_6	25% RDF + 50% Poultry manure + 50% Neem cake	6.71	9.61	13.49
T_7	50% RDF + 25% Neem cake + 25% Vermicompost + 25% FYM + Azospirllum	6.80	11.93	13.88
T_8	75% RDF + 25%(Vermicompost + Neem cake + FYM + Poultry manure) + Azospirillum	6.70	11.75	13.42

C.D. 5% - 0.803;SE(m)- 0.262;SE(d)- 0.371;C.V- 4.617

Leaf Area

The significantly maximum 271.68, 521.03 and 720.24 cm^2 leaf area plant were recorded in treatment T7 (50% RDF + 50% (FYM + Poultry manure + Vermicompost +Neem cake) + Azospirillum), followed by T8 (75% RDF+25% (FYM + Poultry manure + Vermicompost + Neem cake+Azospirillum) which recorded 256.98, 508.99 and 705.39 cm^2 and T8 (Neem cake 2.5t/ha + Vermicompost 4t/ha +) (228.57, 453.78 and 638.36 cm^2) at 15, 30 and 45 days after sowing, respectively and which were at par with each other. It was observed the minimum (188.95, 347.56 and 612.35 cm^3) in treatment T1(Control) at 15, 30 and 45 DAS, respectively.Findings are in conformity with the findings of Jaishankar 2018; Mali et al 2018 and Yadav et al 2018.

Table - 3 : Effect of integrated nutrient management of leaf area of radish at 15, 30, 45 DAS.

Treatment mark	Treatment	Leaf area in radish (cm^2.)		
		15 DAS	30 DAS	45 DAS
T_1	Control	188.95	347.56	612.35
T_2	100% RDF (50:100:50)	234.73	469.78	647.56
T_3	100% Vermicompost	221.62	433.11	629.45
T_4	100% FYM + 50% Neem cake	241.73	482.93	689.96
T_5	100% Vermicompost+ 50% Neem cake + Azospirillum	228.57	453.71	638.36
T_6	25% RDF + 50% Poultry manure + 50% Neem cake	222.45	438.24	627.03
T_7	50% RDF + 25% Neem cake + 25%Vermicompost + 25% FYM + Azospirllum	271.65	521.03	720.24
T_8	75% RDF + 25%(Vermicompost + Neem cake + FYM + Poultry manure) + Azospirillum	265.98	508.99	705.39

C.D. 5% - 31.58;SE(m)- 10.31;SE(d)- 14.58;C.V- 3.969.

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Short Communication

STUDI DIVERSITY AND DISTRIBUTION OF INSECTA: HEMIPTERA OF PENCH TIGER RESERVE, MADHYA PRADESH INDIAES ON THE EFFECT OF INTERGRATED NUTRIENT MANAGEMENT ON VEGETATIVE GROWTH, OF RADISH (RAPHANUS SATIVAS L.) CV. PUSA RESHMI

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INTRODUCTION

Bugs (Hemiptera) are fifth largest group, covering 8% of total proportions of global fauna of insect world. They are phytophagous, predators, haematophagous, omnivorous and also economically important beneficial as well as harmful and used in biological control, terrestrial, aquatic, even marine. At present order Hemiptera include 4 suborders *viz.* Sternorrhyncha, Auchenorrhyncha, Colleorrhyncha and Heteroptera (Henry, 2009). It comprises about 1,02,183 species worldwide, of which about 6,479 species under 92 families have been reported from India (Zhang, 2013; Chandra, 2013). Henry (2009) estimated a total of 42,347 species of Heteroptera, worldwide. Earlier work on central India done by Distant, (1902, 1904, 1906, 1908 and 1910). Chandra *et al*., 2021 reported 390 species from Central India.

Most bugs feed on plant juices and many are serious pests of cultivated crops. However, some are predatory in habit and are useful as controller of plant pests.

The order Hemiptera from PTR is represented by 11 species pertaining to 10 genera and 5 families.

SYSTEMATIC ACCOUNT

ORDER HEMIPTERA

Suborder AUCHENORRHYNCHA (Amyot and Serville, 1843)

Infraorder FULGOROMORPHA Evans, 1946

Superfamily FULGOROIDEA Latreille, 1802

Family FULGORIDAE Latreille, 1807

1. *Dichoptera hyalinata* (Fabricius, 1781)

1781. *Dichoptera hyalinata* Fabricius, (*Fulgora*) *Spec. Ins*., **2**: 315.

1906. *Dichoptera hyalinata*: Distant, *Fauna British India*, *Rhynchota*, **3**: 238.

***Material examined*:** Karmajhiri; June, 2001 (2 exs.).

***Length*:** excl. Tegm. 19-20mm; exp. Tegm. 50 mm.

Distribution: India: Andaman and Nicobar Island, Karnataka, Madhya Pradesh, Maharashtra, and West Bengal. ***Elsewhere*:** China, and Sri Lanka.

Family CERCOPIDAE Laech, 1815

2. *Callitettix versicolor* (Fabricius, 1794)

1794. *Callitettix versicolor* Fabricius, (*Cicada*) *Ent. Syst*., **4**: 50.

1858. *Sphenorhina approximans*: Walker, *List Hom. Suppl*.: 185.

1908. *Callitettix versicolor*: Distant, *Fauna British India*, *Rhynchota*, **4**: 113.

***Material examined*:** Tikari Camp, Ghat Pindrai, Bison Camp; July, Aug., 2001 (3 exs.).

Length: Excl. Tegm. 9 mm. Exp. Tegm. 20-22 mm.

***Distribution*:** India: Assam, Madhya Pradesh, Chhattisgarh, Sikkim, Maharashtra, and Uttarakhand. ***Elsewhere*:** China, Myanmar, Malaysia, Malay Peninsula, Thailand, and Vietnam.

Suborder HETEROPTERA Latreille, 1810

Infraorder PENTATOMORPHA Leston, Pendergrast and Southwood, 1954

Superfamily PENTATOMOIDEA Leach, 1815

Family PENTATOMIDAE Leach, 1815

Subfamily PENTATOMINAE Leach, 1815

3. *Bagrada hilaris* Burmister, 1835

1835. *Bagrada hilaris* Burmister, *Hand de Ent.,* 2: 128.

***Material examined*:** Karmajhiri; June, 2001 (1 ex.).

Length: 5-7 mm.

Distribution: India: Chhattisgarh, Madhya Pradesh, Maharashtra, Manipur, Uttarakhand, Uttar Pradesh, and West Bengal. ***Elsewhere*:** Pakistan, and Sri Lanka.

4. *Halys dentatus* (Fabricius, 1775)

1775. *Halys dentatus*, Fabricius (*Cimex*) *Syst. Ent*.: 702.

1837. *Halys serrigera* & *serricollis*: Westwood, *In Hope Cat. Hem*., **1**: 23.

1902. *Halys dentatus*: Distant, *Fauna British India*, *Rhynchota*, **1**: 119.

***Material examined*:** 3 exs., Karmajhiri, Dam No. 7; June, Aug., 2001.

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

5. *Erthesina fullo* (Thunberg, 1783)

1783. *Erthesina fullo* Thunberg (*Cimex*) *Nov. Ins. Spec*., **2**, 42.

1794. *Cimex mucoreus*: Fabricius, *Ent. Syst*., **4**: 117.

1902. *Erthesina fullo*: Distant, *Fauna British India*, *Rhynchota*, **1**: 119.

***Material examined*:** Mohgaon; Aug., 2001 (1 ex.).

Length: 20-25 mm.

Distribution: India: Andaman and Nicobar Islands, Andhra Pradesh, Assam, Chhattisgarh, Kerala, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh, and West Bengal. ***Elsewhere:*** China, and Japan.

Superfamily PYRRHOCOROIDEA Southwood, 1956

Family PYRRHOCORIDAE Amyot and Serville, 1843

6. *Dysdercus koenigii* (Fabricius, 1775)

1775. *Cimex koenigii* Fabricius, *Syst. Ent*., 720.

2010. *Dysdercus koenigii* (Fabricius): Saha and Bal, *Fauna of Uttarakhand, State Fauna Series,* **18** (2): 248.

Material examined: Bodanala; July, 2001 (1 ex.).

Length: 16 mm.

Distribution: India: Andaman and Nicobar Islands, Assam, Chhattisgarh, Karnataka, Madhya Pradesh, Meghalaya, Nagaland, Sikkim, Uttarakhand and West Bengal.

Elsewhere: Australia, Myanmar and Sri Lanka.

Infraorder CIMICOMORPHA Leston, Pendergrast and Southwood, 1954

Superfamily CIMICOIDEA Latreille, 1802

Family REDUVIIDAE Latreille, 1807

7. *Ectomocoris quadriguttatus* (Fabricius)

1781. *Reduvius quadriguttatus* Fabricius, *Spec. Ins.*, **2:** 380.

2006. *Ectomocoris quadriguttatus* (Fabricius): Ambrose, *Zoos' Print Journal,* **21** (9): 16-17.

***Material examined*:** Karmajhiri; June, 2001 (1 ex.).

***Length*:** 14-17 mm.

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

9. *Ectrychotes dispar* Reuter, 1881

1881. *Ectrychotes dispar* Reuter, *Act. Soc. Sc. Fenn.*, **12:** 304.

***Material examined*:** Karmajhiri; June, 2001 (2 exs.).

Length: 12 mm.

Distribution: India: Andhra Pradesh, Bihar, Chhattisgarh, Diu, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh, West Bengal. ***Elsewhere:*** Bangladesh, and Nepal.

10. *Polididus armatissimus* Stål, 1859

1859. *Polididus armatissimus* Stål, *Ofv. Vet.-Ak. Forh.*: 376.

1904. *Polididus armatissimus*: Distant, *Fauna British India*, *Rhynchota*, **2**: 386.

***Material examined*:** Tikari Camp; July, 2001 (1 ex.).

***Length*:** 10 mm.

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Puducherry, Punjab, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal. ***Elsewhere:*** Bangladesh, China, Former USSR, Japan, Myanmar, Philippines, and Sri Lanka.

11. *Tribelocephala comparanda* (Bergroth, 1910)

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1910. *Tribelocephala orientalis* Distant, *Fauna British India*, *Rhynchota*, **5**: 182.

Material examined: Karmajhiri; June, 2001 (5 exs.).

Length: 10.0-10.5 mm.

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

DISCUSSION

This study confirms 11 species belonging to 10 genera and 5 families from the order Hemiptera from the PTR, Madhya Pradesh.

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SKILLS DEVELOPMENT THE SUCCESS OF MAKE IN INDIA IN IT AND AGRICULTURE SECTOR IN INDIA

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ABSTRACT

About 0.8 billion out of 1.3 billion of India's population are in the working age, in which, only a few % get jobs and remaining only search for the job every year. Even though,most of them are literate, they are not getting jobs as their skills do not match with the job requirements. Therefore, there is an urgent need of Skill Development Strategy for Employment growth tending towards the Economic growth and Social Development including the quality of life in India. As far as Agricultural Sector is concerned, slow agricultural growth is of major concern as about 60% of the people depend on rural employment for living. The current agricultural products are neither economically nor environmentally sustainable in India due to poorly maintained irrigation system, poor extension services, poor preservation and packaging, lack of organized retails, poor roads & transport for accessing markets, poor & major roles of middleman in marketing etc. It has also been found that lack of cold storage and harvest spoilage cause over 30% of farmer's produce going to waste every year. The Indian farmer receives just 10 to 23% of the price the Indian consumer pays for exactly the same produce, whereas the farmers in developed economies of Europe and the United States, in contrast, receive 64 to 81% as per the sources.In IT sector, every year about 5.5 Millions of students graduating but about 0.7 Millions are only employable by the IT/BPM Industries in India.

As per India's Skill Development Report 2015 during the year 2014, there are only about 1.5 lacs people have been trained in Agricultural/Rural Sector, about 2.0 lacs in automobiles, about 0.6 lacs in Electronics and IT hardware, 0.06 lacs in entrepreneurship, about 1.8 lacs in IT & Software Development, 1.04 lacs in ITES/BPO and 4.44 lacs in IT/ITES by the Govt. of India.

Fig: 1 Major Skill Sector In India

This shows that Skill Development is still a challenge in sustainable development in India and following issues need to be addressed:

(a.) The gap between literate and talented manpower

(b.) Transforming literate to talented manpower through skill development initiatives

(c.) Find and exploit new markets and new technologies for new jobs

(d.) Enhancing productivity and competitiveness through Industries involvement

(e.) Support for innovation, research & development as a source of ideas for new jobs

(f.) Stimulating investment by Venture Capitalist for supporting entrepreneurship

Keywords : *Training, apprenticeship, skills,Agricultural/RuralSector,IT/BPM Industries*

INTRODUCTION

The establishment of IT industry in India has a favourable impact on the economy of our country. In India, IT industry mainly includes IT Services and business process outsourcing (BPO). According to NASSCOM report the industry has increased its contribution in Indian economy from GDP 1.20% in 1998 to GDP 7.5% in 2012. In the year 2012-2013 this sector has contributed 56.9 per cent of the gross domestic product (Prasad et al. , 2014). According to NASSCOM 2015 report, this sector has 9.5% share in National GDP driven by significant exports to western countries (NASSCOM, 2015). It has created millions of opportunity and has a positive impact on the life of millions of people.

This sector has provided new job opportunities and at present employs about three millions directly and 9.5 million indirectly. Along with notable Indian IT player like Infosys, Wipro, TCS, Tech Mahindra and HCL there are number of leading foreign player as well in the market. Because of rapid growth and huge profit there is large number of medium and small scale IT

Fig: 2 As Per India Skill Development Report 2015 STATES WITH A HIGHEST 'EMPLOYABLE' POPULATION

India is cost competitive in providing IT services, which is approximately 3-4 times cheaper than the US. This continues to be its unique selling proposition (USP) in the global sourcing market. (India brand equity foundation, August 2015).According to NASSCOM 2015 report, 10 million Indians are working in IT industry (IT &ITeS) (India brand equity foundation, August 2015, www.ibqf.org, NASSCOM). Most of the managers are in their 20's and 30's. It has been observed that 75% of employees working in IT sector are below 45 year of age and by 2022, India will be at the first position having most of the young people working in country making Young India and it will become the best period for the country to grow at the fastest optimum rate.

The Agricultural Sector has contributed in GDP by 17% whereas the Industry by 26% and services by 57%. If we see the labor forces by occupation, the agriculture sector has 49% whereas the industry sector has 20% and services sector has 31%.As far as Agricultural Sector is concerned, slow agricultural growth is of major concern as about 60% of the people depend on rural employment for living. The current agricultural products are neither economically nor environmentally sustainable in India due to poorly maintained irrigation system, poor extension services, poor preservation and packaging, lack of organized retails, poor roads & transport for accessing markets, poor & major roles of middleman in marketing etc. It has also been found that lack of cold storage and harvest spoilage cause over 30% of farmer's produce going to waste every year. The Indian farmer receives just 10 to 23% of the price the Indian consumer pays for exactly the same produce, whereas the farmers in developed economies of Europe and the United States, in contrast, receive 64 to 81% as per the sources.

The exports goods from India are software, petrochemicals, agriculture products, jewelry, engineering goods, pharmaceuticals, textiles,

chemicals, transportation, ores and other commodities.India has emerged as a significant agriculturalexporter in a few commoditiessuch as cotton, rice, meat, oil meals, pepper and sugar. As per the World Trade Organization's Trade Statistics, the shares of India's agricultural exports and imports in world trade in 2013–14were 2.7 per cent and 1.3 per cent,respectively.The government of India isfunding through various schemes for production growth, infrastructureandassets. In order to promote development of a common national market for agricultural commodities through e-platforms, the Govt. of India has already taken initiatives.

There is a need for increased investment in agriculture and food sector in various areas such as research, education, extension, irrigation, fertilizers, and laboratories to test soil, water and commodities are housing and cold storage. There are wide gaps persisting in the yields within states. Various top producer states have comparatively much lower yield in different crops when compared to the rest of the world. There is a need to bridge the yield-gap to the extent feasible within the climatic zone. There is a need to bring states on board for creating national common market for agricultural commodities.

Issues:

Both the sectors as chosen in this article are very important as far as Indian economy is concerned.So; we felt that there should be some analysis on its supply chain of talented professionals. Why we are naming it as talented professional as every person getting degree in the field whether technical or non- technical, is a professional or eligible for the job, but all are not getting job/employment. So, those who are getting jobs are termed as the talented professionals. The reason for this may be any of the following: The company or job profile does not suites to the candidate, the candidate is not found suitable by the company, the candidate is not able to reach to the right company and vice versa or there is not much jobs that can cater to all the eligible. What should we do? Either change the course curriculum or to teach only what Industries want? But without the basics this can't be done. So, what is the optimum solution for this?

Challenges:

There is a need for increased investment in agriculture and food sector in various areas such as research, education, extension, irrigation, fertilizers, and laboratories to test soil, water and commodities are housing and cold storage.

There are wide gaps persisting in the yields within states. Various stop producerstateshave comparatively much lower yield in different cropswhen compared to the rest of the world. There is a need to bridge the yield-gap to the extent feasible within the climatic zone. There is a need to bring states on board for creating national common market for agricultural commodities. Make in India campaign.

The Prime Minister has made the revival of Indian manufacturing a top priority, reflected in his 'Make in India 'campaign and slogan that aims to transform India into a manufacturing hub.

The Make in India Programme is aimed to facilitate investment, foster innovation, enhance skill development, protect intellectual property, and build best-in-class manufacturing infrastructure.

Information on twenty-five priority sectors has been provided on a web portal along with details of FDI policy, National Manufacturing Policy, and intellectual property rights among others.

The initiative also brings to light the challenges faced by the Indian manufacturing sector especially since it has been stagnant as compared to other East Asian countries.

An important question that arises from the campaign is what to make in India, i.e., what to focus on for growth; themanufacturing or the services sector as the transformational sectors highlighted by the Government could belong to either categories.

For the initiative to be successful in India, the sectors need to possess these five attributes: high level of productivity, unconditional convergence, expansion, alignment with comparative advantage and tradability Skilldevelopment: After the setting up of a new Ministry of Skill Development and Entrepreneurship to promote skill and entrepreneurial activities, work is being undertaken on setting up common norms for skill training across central ministries/departments. Thirty-one industry/employer-led Sector Skill Councils (SSCs) have been made operational and these have been aligned with the twenty-five sectors of 'Make in India'. To create a common standard for skills training and certification in the country, efforts are on to align the National Council for Vocational Training (NCVT), school boards, and the University Grants Commission (UGC)

Make in India Campaign:

The Prime Minister of India has made the revival of Indian manufacturing a top priority, reflected in his 'Make in India' campaign and slogan that aims to transform India into a manufacturing hub.The Make in India Programme is aimed to facilitate investment, foster innovation, enhance skill development, protect intellectual property, and build best-in-class manufacturing infrastructure. The Information on twenty-five priority sectors has been provided on a web portal along with details of FDI policy, National Manufacturing Policy, and intellectual property rights among others. This initiative also brings to light the challenges faced by the Indian manufacturing sector especially since it has been stagnant as compared to other East Asian countries.An important question that arises from the campaign is what to make in India, i.e., what to focus on for growth; the manufacturing or the services sector as the transformational sectors highlighted by the Government could belong to either categories. For the initiative to be successful in India, the sectors need to possess these five attributes: high level of productivity, unconditional convergence, expansion, alignment with comparative advantage and tradability Skill development. After the setting up of a new Ministry of Skill Development and Entrepreneurship to promote skill and entrepreneurial activities, work is being undertaken on setting up common norms for skill training across central ministries/departments. Thirty-one industry/employer-led Sector Skill Councils (SSCs) have been made operational and these have been aligned with the twenty-five sectors of 'Make in India'. To create a common standard for skills training and certification in the country, efforts are on to align the National Council for Vocational Training (NCVT), school boards, and the University Grants Commission (UGC) etc.

Fig: 3 Skill Development Sector In India

Solutions and Recommendations:

The solution to the issues as raised above is only through the skill development of the aspirants/ candidates.This is the only gap between the issues as raised above. As per India's Skill Development Report 2015 during the year 2014, there are only about 1.5 lacs people have been trained in Agricultural/Rural Sector, about 2.0 lacs in

automobiles, about 0.6 lacs in Electronics and IT hardware, 0.06 lacs in entrepreneurship, about 1.8 lacs in IT & Software Development, 1.04 lacs in ITES/BPO and 4.44 lacs in IT/ITES by the Govt. of India.

This shows that Skill Development is still a challenge in sustainable development in India and following issues need to be addressed:

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(f.) Stimulating investment by Venture Capitalist for supporting entrepreneurship

Fig.: 4 Overall Growth Performance of the Indian IT/BPM Sector

	Value (in US$ billion)					Growth rate (per cent)		
	2008-09	2010-11	2012-13	2013-14E	2014-15 P	2012-13	2013-14E	2014-15 P
IT-BPM service	**59.9**	**76.3**	**95.2**	**105.0**	**118-123**	**8.6**	**10.3**	**12**
Revenues								
Exports	47.1	59.0	76.1	86.0	97-100	10.6	13.0	13-15
Domestic	12.8	17.3	19.2	19.0	21-23	1.1	-1.0	9-12
Employment (in million)	**2.2**	**2.5**	**3.0**	**3.1**	—	**6.9**	**5.6**	—

Source : NASSCOM.

Note : E—Estimate, P—Projections (revenue is excluding hardware services).

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FUNGAL AIR-SPORA OF AIIMS CAMPUS, GORAKHPUR WITH REFERENCE TO DIVERSITY AND PATHOGENICITY OF ASPERGILLUS SPECIES

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ABSTRACT

Studies on fungal air-spora of any locality is very important as air-born spores of fungi cause infestation and infection of economically important objects, plants, animals and even humans as well. It becomes more significant in the areas like district hospitals, medical colleges and other medical institutions, which are regularly visited by patients and their attendants. The patients are already immunocompromised and have maximum chances of infection by air spores of pathogenic fungi like *Aspergillus etc*. Therefore, it has always been a challenging job for scientists and pathologists to study fungal air-spora of a defined locality. Keeping this fact in view, the present investigation has been done to study the diversity of various species of *Aspergillus* in the campus of All India Institute of Medical Sciences (AIIMS), Gorakhpur, Uttar Pradesh, and their pathogenicity with special reference to allergenic properties. This investigation was performed from April, 2023 to March, 2024, using parameters like variations in *Aspergillus* species with reference to season and time. The maximum number of *Aspergillus* species were recorded in the months of April, May and October, 2023 (12 species) and minimum number in January and February, 2024 (03 species). Isolates of *Aspergillus* species were also recorded, which were maximum in April, 2023 month (34 isolates) and minimum in January, 2024 (only 03isolates). As far as seasonal variations are concerned, the hot summer season has highest number of species and isolates (11species and 30 isolates). Contrary to this, only 06 species and 09 isolates were recorded in winter season, and 07 species and 11 isolates in rainy season. If this fungal air-spora data of *Aspergillus* species is compared with clinical data of patients visiting AIIMS, Gorakhpur, it is found that maximum number of patients suffering from various allergic diseases is in summer months and minimum in winter months.

Keywords: *Fungal air-spora, aspergillus, aeroallergens, pathogenicity.*

INTRODUCTION

Various species of fungi and their spores present in the air of a particular locality form fungal air-spora of that locality. Studies on this fungal air-spora is very significant as they cause infestation and infection to various economically and culturally important objects, plants, animals and humans as well. Aeromycologists have studied and reported air-spora of different parts of the world (Frankland and Hart, 1887; Hamilton, 1939;Richards,

1954;Hirst, 1955; Werf, 1958 Gregory, 1961; Derrick and Linnan, 1963; Turner; 1966; Corbaz, 1969; Kimura and Yamamoto, 1972; Gregory, 1973;Rubulis, 1984;Kastrzyk, 2008; *etc.*). Studies on fungal air-spora of India was started by Cunningham (1873) to examine air fungi of Calcutta prison. His work was carried over by various scientists, who studied air-spora over agricultural fields and also over urban areas (Rajan *et al*., 1952; Kalra and Dumbrey, 1957; Sreeramulu, 1960; Sreeeramulu and Seshavataram, 1962; Sreeramulu and Ramalingam, 1963, 1964, 1966; Sreeramulu, 1972;Agarwal and Shivpuri, 1974; Kamal and Singh, 1974, 1975;Rati and Ramalingam, 1976; Vittal and Ponnusamy, 1979; Verma and Kamal, 1982; Srivastava *et al.,* 1990; Srivastava and Srivastava, 2007; Srivastava, 2014; Sharma *et al.,* 2019 *etc*.).

This work on air-born fungi over urban areas is more significant as fungal air spores are important contaminants and initiate different types of allergic disorders. The incidence of this allergic disorder is very common in Gorakhpur having humid and sub-tropic climatic conditions. Of all these air-born fungi, the fungus genus *Aspergillus* is particularly very important. Various species of *Aspergillus* are aerobic in nature and are reported from almost all oxygen rich environment. This fungus genus is very significant medically and commercially both, and about 60 species are pathogenic in nature (Beneke and Rogers, 1970). Thom and Church (1926) reported that some species of *Aspergillus* cause diseases of respiratory tract in birds, animals and even in humans, causing "Aspergillosis", including Bronchopulmonary Aspergillosis, Acute Invasive Aspergillosis, Disseminative Aspergillosis and Aspergilloma etc.

Keeping these facts in view, the present investigation has been done and diversity of *Aspergillus* species in the air-spora of All India Institute of Medical Sciences (AIIMS), Gorakhpurhas been studied. This study has been performed using various parameters like variations in the spores of *Aspergillus* species in relation to months, season and time, and the possible allergenic properties of these species.

MATERIALS AND METHODS

(1) Air Sampling Sites

All India Institute of Medical Sciences (AIIMS), Gorakhpur was selected as site for air sampling. The campus of AIIMS as well as registration hall for patient's registration, general ward and OPD were examined from April, 2023 to March, 2024.

(2) Fungal Diversity and Climate

Gregory (1961, 1973) suggested that fungal spores are always present in the air, but their number and types vary according to time, weather, season and geographical location. Geographical location of Gorakhpur is Latitude $26^0$13'North and $27^0$29' North, and Longitude $83^0$05' East and $83^0$56' East. This district is located in the Tarai region of North-Eastern Uttar Pradesh, India with humid and sub-tropical climatic conditions. Three main seasons are "Summer Season" (April to June), "Rainy Season" (July to October) and "Winter Season" (November to February). Sampling of spores of *Aspergillus* species has been done accordingly.

(3) Gravity Plate Method for Sampling

Sampling and isolation of various species of *Aspergillus* from air-spora was done by Gravity Plate Method (Frankland and Hart, 1887). Four Petri plates (80 mm diameter) containing Rose Bengal Streptomycin Agar Medium were exposed for 15 minutes at four selected sites of AIIMS, Gorakhpur. This exposure was done three times a day (Morning, Noon and Evening), at 15 days interval. After exposure, these Petri plates were incubated for 07 days at 25 ± 2^0C temperature. The mixed culture obtained after incubation was purified by "Single

Spore Culture Technique" and identification of *Aspergillus* species in pure culture was done (Raper and Fennel, 1965). Total number of fungal colonies present in each Petri plate and number of individual fungal species were counted separately. For quantitative studies, average colony count per Petri plate in one month was calculated.

Table - 1 : Species of *Aspergillus* Micheli Isolated from April, 2023 to March, 2024

S.N.	Species of *Aspergillus*	Number of Isolates in Different Months (April, 2023 to March, 2024)											
		April 2023	May 2023	June 2023	July 2023	Aug. 2023	Sept. 2023	Oct. 2023	Nov. 2023	Dec. 2023	Jan. 2024	Feb. 2024	Mar. 2024
(i)	*A. amstelodami* (Mangin) Thom&Church	-	-	-	-	-	-	-	-	1	1	1	-
(ii)	*A.carneus*(van Tiegham) Blochwitz	2	3	-	-	-	-	1	-	-	-	-	-
(iii)	*A. chevalieri* (Mangin) Thom&Church	1	1	1	-	-	-	1	-	-	-	-	-
(iv)	*A. flavipes* (Bain.&Sart.)Thom& Church	2	1	2	1	-	-	1	1	-	-	-	-
(v)	*A. flavus* Link	3	3	3	1	-	-	2	1	1	1	-	1
(vi)	*A. fumigatus* Fresenius	1	1	1	2	-	1	1	1	1	-	-	-
(vii)	*A. nidulans* (Eidam)Wint.	3	2	4	1	2	1	1	2	-	-		1
(viii)	*A. niger* van Tieghem	5	5	5	3	2	2	3	2	2	1	2	1
(ix)	*A. niveus* Blochwitz	1	1	-	-	-	-	1	-	1		-	-
(x)	*A. ochraceous* Wilhelm	1	1	1	2	1	1	1	1	1	1	-	-
(xi)	*A. regulosus* Thom&Raper	1	1	-	-	-	-	-	-	-	-	-	-
(xii)	*A. sydowii* (Bain. &Sart.)Thom&Church	10	8	6	-	4	2	2	3	4	-	3	1
(xiii)	*A. tamarii* Kita	-	-	-	-	-	-	1	3	-	-	-	-
(xiv)	*A. terreus* Thom	4	4	2	-	-	1	2	1	1	-	-	-
Total Species	**14**	12	12	09	06	04	06	12	09	08	04	03	04
Total Isolates	**164**	34	31	25	10	09	08	17	15	12	03	06	04

Table - 2 : Number of Isolates of *Aspergillus* species in Different Seasons (April, 2023 to March, 2024)

Summer Season(April, 2023 To June, 2023)	Rainy Season(July, 2023 to October, 2023)	Winter Season(November,2023 To March,2024)
11 Species	07 Species	06 Species
30 Isolates	11 Isolates	09 Isolates

Table - 3 : Colony Counts of Aspergillus species in Different Times (April, 2023 to March, 2024)

Morning (8.00 a.m.)	Noon (12.00 Noon)	Evening (06.00 p.m.)
MaximumColonyCountsin April, 2023 (10 Colonies)	MaximumColonyCountsin April, 2023 (16 Colonies)	MaximumColonyCountsin April, 2023 (12 Colonies)
MinimumColony CountsinFebruary, 2024 (02 Colonies)	Minimum Colony CountsinFebruary, 2024 (02 Colonies)	Minimum Colony CountsinFebruary, 2024 (02 Colonies)

OBSERVATIONS AND RESULTS

This investigation was performed over one year (April, 2023 to March, 2024). It is evident from Table – 1 that maximum number of *Aspergillus* species was recorded in the months of April, May and October, 2023 (12 species in each month) and minimum number in months of January and February, 2024 (03 species in each month). The maximum isolates of *Aspergillus* species were recorded in April, 2023 (34 isolates) and minimum in January, 2024 (03 isolates). The seasonal variations of various *Aspergillus* species were also recorded Table – 2). The hot summer season of April, May and June, 2023 has highest number of *Aspergillus* species (11 species) and isolates (30 isolates). However, the winter season (Nov. 2023 to Feb. 2024) has only 06 species and 09 isolates and rainy season (July to Oct. 2023) has 07 species and 11 isolates. The dominance of 03 species of *Aspergillus* has been recorded, which are present in all the three seasons (Summer, Rainy and Winter), named *A. niger, A. flavus and A. fumigatus*. These three dominant species have been deposited in National Fungal Culture Collection of India (NFCCI), Agharkar Research Institute, Pune (Accession Nos. - (*A. niger*: NFCCI5688; *A. flavus* : NFCCI 5710 and *A. fumigatus* : NFCCI 5711) for future studies. The least dominant species is *Aspergillus regulosus*, which was recorded in only two isolates (one isolate each in April and May, 2023) in one year.

Variations in fungal colonies in relation to time has also been observed (Table – 3). Counting of fungal colonies was done in three sampling times – at 08.00 hour in the morning, 12.00 hour in the noon and 18.00 hour in the evening. The maximum colony count in all the three times is observed in the month of April, 2023 (10 colonies in the morning, 16 colonies in the noon and 12 colonies in the evening). The minimum colony count in all the three times is observed in February, 2024 month (02 colonies in all the three times – morning, noon and evening).

RESULTS AND DISCUSSION

The fungal air-spora of AIIMS, Gorakhpur shows a wide range of variation of different species of *Aspergillus* in relation to season and time during one year. Maximum number of *Aspergillus* species and isolates are recorded in the summer months

followed by rainy season. The patient's data of AIIMS, Gorakhpur also reveals maximum number of patients in these two months of summer and rain. Many of these patients are sufferer of respiratory tract diseases, including Aspergillosis. These patients are immunocompromised and are vulnerable to diseases caused by *Aspergillus* species. Although attendants accompanying these patients visiting AIIMS are not immunocompromised, they are also exposed to the spores of *Aspergillus* species present in the air and may be infected.

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A STUDY OF CHITRA BANERJEE'S : THE PALACE OF ILLUSIONS DISPUTED COURTSHIP' WAS EVER OR NEVER

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ABSTRACT

Dharma "Hindu" is full of literary events and cultural events. While each of us has a vast array of topics to study and learn about, the *Mahabharata* is that mythology that helps us control behaviour, misconduct, torture, the passage of time, discipline, sacraments, friendship, love, faith in God, and much more. Each character of this Grantha has a distinct and inspirational role, but in this case, the research is cantered on the character named "Draupadi," around whom this accent continues to roam. The research would cover most of the aspects of this character, both internally and externally. Our ideologies and thoughts have emerged from reading numerous books and Grantha. The majority of our aspects are based on the *Mahabharata* and *Geeta.*" "Either Draupadi or Krishna loved each other, or Draupadi and Karna ever loved each other" has long been a mystery. Every writer and reader have a unique perspective on this. The world has advanced quickly in recent years, and we have not had the time to study our mythology. Although Draupadi is not physically present, many of us have adopted her traits of tenacity, agility, aggression, consolation, and ordination.

Keywords : Adaptability, aggression, dexterity, solace, and ordination.

INTRODUCTION

Numerous authors have shaped this mythology in various ways to express their ideas. While each writer has their own vision for reading and writing, we do not claim or point fingers at any one of them; yet the dissemination of these false materials could have an impact on a certain community or faith. Since "Maharshi Ved Vyas" narrated the *Mahabharata* and Lord "Shri Ganesha" wrote it, there should not be any significant disagreements between the writers' interpretations on which "character" in this epic has shown heroic qualities. Although there may be differences in certain parts, since these Granthas are written with intention and purity, improvisation that leads the reader into unfamiliar territory can be distressing for both the community and religion. Since these mythologies form the foundation of our religion, it is required that writers accurately portray each character in our epic *Mahabharata.*

With Agnideva's blessings, Draupad the king was born out of fire during a Yajna ceremony that included Rishi Yaj and Upyaj. This yajna was performed in order for a son to murder Dronacharya in retaliation. According to folklore, she was the most beautiful and seductive woman alive at the time. She was described as being as strong as a reef, as refined as Maa Laxmi, as doughty as a lion, and as delicate as a lotus jump. Before she was married, Draupdi was a flawless woman; nothing was lacking in her. Because a person's life changed after the Pandavas' victory against Draupadi in Swayamvar,

she encountered challenges and setbacks at every turn. Even when we define her persona up until the very last note, it will always be modest. However, the primary goal of this content is to depict the love and adoration that exist between Karna and Draupdi. Was it ever actually done, or are these just idle chatter?

Some authors assert that Surya Putra "Karna" was the person Draupadi fell in love with if he ever did. Chitra Banerjee, the author of "*Palace of Illusion*," presents Draupadi's love life from a distinct perspective. She said that she had always wanted to get married to Karna because he was the only man for whom she felt feelings of attraction. Because the mythology in this book is imaginary, the information recorded in it is either untrue or non-existent. How can a well-written novel honour us if it is entirely based on fiction? Fiction books can still inspire, but it's important to recognize the sources of the novel's ideas. We cannot take any character from the Ramayana and claim that Seeta never intended to wed Lord Rama or that she had an extramarital affair. All that is recorded in our granthas is pure and true. Another viewpoint on what Maharshi Valmiki or Ved According to Ved Vyas, either Draupadi and Krishna loved one another or Draupadi and Karna never loved one another. We have made every effort to gather as much information as we can for Draupdi and Karna. However, there is not any concrete evidence of a romantic interest between the two. Even though we discovered a few legends about it, the Vedas' *Mahabharata* does not contain these tales.

Furthermore, Draupadi confesses to Karna, "I confess, in spite of the vows I made each day to forget Karna, to be a better wife to the Pandavas, I longed to see him again," according to Chitra Banerjee's "Palace of Illusion." This is the author's original idea; the *Mahabharata* records that Draupadi only encountered Karna three times in her lifetime.

First, when she rejects him during her swayamvara, Second, during Yudhishthir's Rajasuya sacrifice; and Third, how can women love such men? This is evident during the dice game, when Karna essentially persuades everyone that she is a prostitute and needs to be undressed the next time if Karna is thinking this way about Draupadi. Although there were interpersonal disagreements between their ideas, our goal in this instance is not to denigrate Karna—he is a valiant and respected warrior in the annals of archers. If Karna had ever loved Draupdi, how could he have forced her to take off her clothing after both Pitamah Bhisma and Draunacharya had complimented him for not allowing this to happen? Moreover, if Draupdi had truly loved Karna, how could she have prevented him from taking part in Swayamvar by saying Soot Putra? We cannot determine the true intention of these writers, who are attempting to alter a story that never occurred. If the sole purpose of this is to obtain notoriety and popularity, then it is our duty to voice our opposition to such a novelist. The representation of Draupadi and Karna's love story is having an impact on this remarkable woman's character. The way these articles portray Draupadi is grossly distorted. Currently, this generation has either read Granthas or watched TV shows based on the *Mahabharata* to varying degrees. While we can criticize this, in the near future, the younger generation will not have the time to read Granthas and Vedas, so these promoted books and novels will portray our heroes in a negative light.

These things do not end here; we also observe certain facets of Draupadi's love for Krishna that are described as one-sided from Draupadi's perspective rather than as manifestations of divine love. "Yajnaseni: The Story of Draupadi" by Pratibha Ray claims that if Draupadi ever experienced first love, it was solely for Krishna. This is the story that appeared in "Yajnaseni" about King Draupad's response to Krishna's request to set up

Draupad's swayamvar: "O Krishna! Who else could be Aryavart's greatest hero but you? When Krishna is the choice of the heart, what is the need for setting up a Swayamvar? Who else has the ability to defeat Krishnaa (Draupadi) in the Swayamvar except you?"(Page 22; Chapter 4) The text above suggests that Draupad desired for Krishna and Krishnaa (Draupadi) to be united. However, if we read the same story from the end of the Garantha, we find that just as Krishna was about to slay King Draupad, Draupad spared his life by saying, "Before you mangle me, you have to slaughter my father." At that point, Krishna was moved by the unparalleled love that she had for her father. As a result, he offered to kill King. Following their chat, Draupdi and Krishna became friends. On the occasion of Swayamvar, Krishna pledged to Draupdi to take care of her as a younger sister, and they demonstrated their commitment to one another by saving her during Cheerharan. As their sister, Draupdi has always received their love. There have also been people who have observed Krishnaa tie Rakhi on Krishna's hand in the *Mahabharata* dramatization. Furthermore, there is no indication in our mythology that Krishna ever desired to wed Krishna. This is not where this modification and fiction work ends up. When the king inquiries about Arjun and whether he will be able to win the Swayamvar, Yajnaseni has more to say. Draupadi thinks, "I forgot that father had first offered me to Krishna; now I lost myself in fantasies about Arjun. Arjun would have to wear the garland I had been sewing throughout the morning to wrap around Krishna's neck." This indicates unequivocally that Draupdi was eager to wed Krishna. From the writer's perspective, Draupdi's opinions are revealed together with such disparate characteristics. Although the fictitious changes to our mythology are undoubtedly intolerable, we do not object to any specific details in their false substance. This is a stage of increased effort and hard labour. This gives our God Vishnu's incarnation as well as the mythological heroes in our mythology new and unfavourable associations.

The majority of people follow their eyes, and the majority of what we see is these epics' promotion and dramatization. I think that a very small number of us have read the Grantha *Mahabharata*. We only trust the information that is presented to us on TV shows, in books, or through internet searches. Google searches pertaining to Draupdi and Karan's romantic relationship yield a plethora of blogs detailing their past relationship; some even use Chitra Banerjee's "The Palace of Illusion" as a source. It is my sincere hope that the majority of them are unaware that the book is based on mythological fiction, even though the title suggests otherwise. A palace of "illusion" refers to a virtual idea that has never materialized. I was convinced that "Yes, Karna was the only love of her life" even before I decided to write about it because it made me feel like that was the only possible explanation. However, after working on this issue and discovering the accurate narrative and recorded truth, my perspective on the matter abruptly changed. Although you have read some of the written portions from those novels that we have exchanged, I would not advise you to believe what I have to say or how I see things. I would advise you to read, get the facts, and then share them with others.

Our goal is to disseminate the word that might make us realize that changing the epics is not a good idea. We have discussed the elements with two accomplished writers, but these talents need to be directed toward disseminating information. Even if Draupadi is a figure with limited material to study and comprehend, what if we shaped our ideas around these underrepresented women in order to promote our books? This is not how business should be done. The majority of us regard Draupadi as the Pandavas' wife or as a woman who must suffer because of her "Cheerharan." There are other anecdotes and facts about her, though, and we could

have expounded on her chivalry, bravery, dexterity, and beauty. She was a brave woman who never backdown from a challenge and who never hesitated to stand up for what she believed in. She nurtured all of her children equally, including Abhimanyu (the son of Subhadra and Arjun), since she had faith in her husbands. How can someone represent her in a way that she would have preferred to be with Krishna and Karan when she was such a wonderful human? It really is embarrassing to read stuff like this about our heroes. It must be our duty to offer her the respectable status that she truly merits. Her ability to manage situations should be discussed because she demonstrates how to persevere through difficulties and overcome them. However, we present a distinct side of her here that the reader finds unfavourable. We can write something that will pique readers' interest and educate them about our heroes. However, we find a ton of offensive writing when we search for anything related to tremendous Draupadi on search engines. My main concern is to make it clear that Draupdi and Karna have never had an affair. Other than a sacred friendship with Krishna, there was nothing between them. She is being presented by writers in their unique conceptual frameworks. Writing such things about the heroes of our mythology is not acceptable. We are fortunate to have such queens and warriors guiding us on this life journey. We all have times in our lives when we feel down, confused, or in need of encouragement. Next, we can study Granthas and mythology to understand how they have triumphed in various circumstances, like those involving Draupadi or Pandavas. These people are our heroes because we respect, believe in, and learn from them. As such, we should offer them the respect they are due.

In conclusion, Draupdi is a distinguished envoy who was endowed from birth with extraordinary abilities by kindling fire. For her contributions to our saga, they deserve millions of salutes and expressions of gratitude. We are fortunate to be able to read and write about Draupadi and to swear to uphold her ideas, courage to speak up, bravery to spark, and freedom to fight. We welcome you and your shadow and want to walk in the footsteps of the example you have set for this generation.

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FIRST RECORDS OF EUSTHENES BRINAE YANG, 1935 (HEMIPTERA: TESSAROTOMIDAE) FROM INDIA, WITH AN UPDATED CHECKLIST FROM THE COUNTRY

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ABSTRACT

The paper presents first records of *Eusthenes rubefactus* from Himachal Pradesh and *Eusthenes brinae* from India along with an updated checklist of Genus *Eusthenes* Laporte, 1832 from India with distribution.

Keyword : *Eusthenes, rubefactus, brinae, checklist, first records.*

INTRODUCTION

The group of tessarotomid bugs was raised to subfamily level under Pentatomidae family by Stål (1865). In 1909, Kirkaldy mentions about 11 tribes of Tessarotomide worldwide. Following the Kirkaldy's classification system, Leston reduced some of the tribes to subtribe and described two new subtribes in the year 1955. Now a days, taxonomists follow Kumar's (1969) classification system in which he divided Tessarotomidae family in 3 subfamilies viz. Natalicolinae, Oncomerinae and Tessarotominae. Later, In 1995, Schuh and Slater reviewed the systematics and biological importance of this family.

Most of the members of this family are large in size and characterized by metallic color, large sterna plate between intermediate and hind coxae and short labium. It comprises of 240 species under 55 genera (Biswas, 2023). They are phytophagous and act as the agricultural pests. Few species of this family are consumed by human beings in few countries. There are few tessaratomids that show parental care. When a chemical substance is secreted by some tessaratomids comes into touch with human skin, it can harm it and perhaps result in temporary blindness. Tessaratomids in India contains 41 species of 14 genera belonging to 2 subfamilies (Biswas, 2023).

Genus *Eusthenes* Laporte, 1832 is one of the genus belonging to Tessaratominae Stal, 1865 subfamily. There are 12 species of Genus *Eusthenes* in India (Biswas, 2023). Till date 14 species has been described from the India.

MATERIALS AND METHODS

Himachal Pradesh is one of the northern states of India with 12 districts. It has altitudinal gradient which affects the type of flora and fauna in this region. While a visit to a tourist place The Ridge in Shimla on 17 June 2024 which is located on the height of 2205 metres, a specimen of Tessarotomidae family was found and collected by Archana Sagar. The specimen was stretched and

pinned which was later identified as *Eusthenes rubefactus* Distant 1901.

Some of the specimens of tessarotomids were collected on a survey to Dedgharat Solan H.P. on 06 August 2024. The location had latitude 30.95285°N and longitude 77.11650°E and altitude of 1443 metres. The weather condition recorded during the collection was 26°C temperature and 73% humidity. The collection was made in wild vegetation but the specimens were collected by handpicking method from the thorny trees of cocker berry plant. The specimens were stretched and pinned. It was later identified as *Eusthenes brinae* Yang 1935. Specimens collected had one male and three female specimens.

Taxonomic Account

Order HEMIPTERA Linnaeus, 1758

Suborder HETEROPTERA Latreille, 1810

Infraorder PENTATOMORPHA, Pendergrast & Southwood, 1954

Superfamily PETATOMOIDEA, Leech 1815

Family TESSARATOMIDAE Stal, 1864

Subfamily: Tessaratominae Stal, 1865

Tribe: Tessaratomini Stal, 1865

***Eusthenes* Laporte, 1832**

Type species: *Tessaratoma robusta* Lepeletier and Severin, 1828. by monotype

***Eusthenes rubefactus* Distant 1901**

Eusthenes rubefactus Distant, 1901. *Trans. Ent. Soc. London* p. 111.

Eusthenes diomedes Breddin, 1904. *Wien. Ent. Ztg*. 23: 15-16. syn. by Distant, 1921

Material Examined: Himachal Pradesh, Shimla, 17.vi.2024, Coll. A. Sagar

Diagnostic Character: Body above dark olivaceous, body below pale yellowish, connexivum yellowish green with yellow spots at the segment, antennae black with apical joint yellowish, third joint shorter than second and fourth joint, lateral angles of pronotum subprominent and wrinkled.

Redescription: Head, pronotum, scutellum and corium greenish, abdomen above castaneous with reddish tinge, antennae black with apical joint ochraceous, legs ochraceous, abdomen below whitish yellow, jugum meeting over the tylus, anterior part of pronotum with horizontal comma shaped pattern, connexivum with yellowish spots, metasternum elevated.

Distribution: Myanmar, India (Assam), Indo China, Sri Lanka, Taiwan, Vietnam; (Rolston *et al*. 1993)

Remarks: This species has been recorded for the first time from Himachal Pradesh.

***Eusthenes brinae* Yang, 1935**

Material Examined: Himachal Pradesh, Solan Dedgharat, 06.viii.2024, Coll. A. Sagar

Diagnostic Character: Body purplish brown, pronotum with horizontal comma shaped pattern, Scutellum paler in color than corium and pronotum, tibia and femora piceous, femora with double series of spines, femora with large curved spine near the base in males, abdomen below metallic green. Metasternum elevated with reddish brown in colour, tip of apical joint of antennae, tarsi and tarsal claws wine red, tip of scutellum reddish yellow.

Distribution: Laos, Myanmar, Vietnam.

Remarks: This species has been recorded for the first time from India (Himachal Pradesh)

Checklist of Genus *Eusthenes* Laporte, 1832 from India with distribution (Source: http://www.heteroptera.fr/tessite/Eusthenes/eusthenes.html)

1. ***Eusthenes cupreus*** (Westwood, 1837)

   Distribution: India: Assam, Sikkim

   Elsewhere: Bhutan, Burma, China, Laos, Malay Penninsula, Malaysia, Nepal, Sri Lanka, Taiwan, Thailand

2. ***Eusthenes eurytus*** Distant, 1887
   Distribution: India: Sikkim
   Elsewhwere: Silhet (Bangladesh)
3. ***Eusthenes hercules*** Stal, 1870
   Distribution: India: Assam
   Elsewhere: Java
4. ***Eusthenes jason*** Stal, 1870
   Distribution: India: N. India
   Elsewhere: Java
5. ***Eusthenes polyphemus*** Stal, 1863
   Distribution: India: Assam, Sikkim
   Elsewhere: Burma, Vietnam
6. ***Eusthenes robustus*** (Lepeletier &Serville), 1825
   Distribution: India: Assam, Bengal, Sikkim
   Elsewhere: Bhutan, Borneo, Suwalesi, China , E. Indies, Indo-China, Java, Malay Penninsula, Macao, Sumatra, Thailand, Vietnam
7. ***Eusthenes rubefactus*** Distant, 1901
   Distribution: India: Assam
   Elsewhere: Myanmar, Indo-China, Sri Lanka, Taiwan, Vietnam
8. ***Eusthenes seavus*** Stal, 1863
   Distribution: India: Assam, Sikkim
   Elsewhere: Bhutan, Borneo, China, Indo-China, Malay Penninsula.
9. ***Eusthenes scutelleris*** (Herrich-Schaffer),1838
   Distribution: India: Assam, Hindustan
   Elsewhere: Indo-China, Java, Nepal, Sri Lanka, Sumatra
10. ***Eusthenes theseus*** Stal,1870
    Distribution: India: Sikkim, W. Bengal
    Elsewhere: China, Indo-China, Laos, Nepal, Taiwan, Vietnam
11. ***Eusthenes thoracicus*** Distant, 1900
    Distribution: India: Assam
12. ***Eusthenes veriegatus*** Yang,1934
    Distribution: India: Assam
    Elsewhere: Burma, China, Indo-China, Laos, Vietnam
13. ***Eusthenes rubefactus*** Distant 1901
    Distribution: India: Assam, Himachal Pradesh
    Elsewhere: Myanmar, Indo China, SriLanka, Taiwan, Vietnam
14. ***Eusthenes brinae*** Yang, 1935
    Distribution: India: Himachal Pradesh
    Elsewhere: Laos, Malay Penninsula, Vietnam

RESULTS AND DISCUSSION

While working on Terrestrial Hemiptera from Himachal Pradesh, one species of the genus *Eusthenes* namely *Eusthenes rubefactus* Distant 1901 was found to be recorded first from Himachal Pradesh and one species namely *Eusthenes brinae* Yang, 1935 were found to be recorded first from India. In world a total of 18 species of Genus *Eusthenes* have been recorded till now of which 14 species have been recorded from India. The species are mainly recorded from Himalaya region and Assam. Very less work has been done on this family in Himachal Pradesh. The findings of such rare bug species from this are illustrates that this area is very rich and many more such species are expected.

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***Eusthenes brinae* Yang, 1935**

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Qasim, S.Z. and Gopinathan, C.K. , 1969. Tidal cycle and the environmental features of Cochin back waters (a tropical estuary), *Proc.Indian Acad. Sci.* 698 (6) : 336-48.

Report : Pathak, S.C. and Palanisamy, K., 1995. Shrimp and carp aquaculture and the environment in India. *India study report ADB & NACA Publication* : 75 pp. + 45 annex.

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