Different Types of Feathers in Birds

Submitted to
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Declaration

We are 6 members in group project hereby declare that this project entitled “Feathers of different birds in Telangana “. Submitted by our group under the guidance and supervision of Dr. Mithun Kumar Rathod , Mr. B. Ramakrishna and HOD Mr. Y. Ramesh Babu is an original. We also declare that it has not been Submit previously in part or in full to this Tara Government College (A), Sangareddy.

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Certificate

This is to certify that the project “Feathers of different birds in Telangana ” submitted by D. Srishailam ,Ch. Navneetha, G. ShivaRaj , M.Vittal, M.Indira

Supervisor HOD of department

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Abstract:

We all know that birds evolved from theropod dinosaurs during the Jurassic period(around 150 million years ago).so many birds became extinct but still we have their fossils in so many worldwide famous museums in many countries and we have wild life sanctuaries for birds too which are going yto extinct for reference. One of their unique characteristic is to fly in the air. To fly, their hindlimbs modified into special structures called feathers. Many scientists did research on their feathers to

know in detail. birds are classified based on their types, structure and functions of feathers based on their species.

In our project to know more about their feathers in detail we collected some samples of feathers of different feathers from different areas of our state Telangana.

Key findings: bird, feathers, fly, sanctuaries.

Abbreviations:

BFDV: Beak and Feathers Disease Virus

PCB: polychlorinated biphenyls

OCP: organochlorine pesticides

PBDE: polybrominated biphenyl ethers

OPP: organophosphate pesticides

PAH: polycyclic aromatic hydrocarbons

PYR: pyrethroids

Introduction:

background study:

Birds area group of warm blooded vertebrates constituting the class aves, have characters like feathers, toothless beaked jaws, the laying of hard- shelled eggs, a high metabolic rate, a four chambered heart and a strong yet light weight skeleton and so many other useful characters.

birds live around the world and range in size from 5.5 cm which is bee hummingbird to the 2.8m that is ostrich, a flightless bird.

It is stated that there are about ten thousand living species , more than half of

which are perching birds. Birds have wings whose development changes according to species. The only group without wings are the extinct moa and elephant birds.

wings which evolved from forewings gave birds ability to fly and not only that further evolution has led to the loss of flight in some birds which includes ratites, penguins and diverse endemic island species. The birds digestive and respiratory system are also uniquely suitable for flight. some bird species of aquatic environments particularly sea birds and some water birds have further evolved for swimming.

classification:

kingdom: Animalia

phylum: chordata

clade: sauropsida

class : Aves

based on feathers birds are divided into two groups

1. flying birds

2. flightless birds

1. flying birds: bird flight is the primary mode of locomotion used by most bird species in which birds takes off and fly . flight provide birds with uses like feeding, breeding, avoiding predators and migrating. bird flight is one of the most complex form of locomotion in the animal kingdom.

various theories exist about how bird flight evolved and also flight from falling or gliding means the trees down hypothesis ,from running or leaping means the ground up hypothesis, from wing assisted incline running or from pouncing behaviour.

2.flightless birds: flightless birds are birds that through evolution lost the ability to fly. there are over 60 extant species including the well known ratites and penguins. the smallest flightless bird is the inaccessible island rail .the largest flightless bird and also the largest living bird is the ostrich.

feather:

feathers are epidermal growths that form a different outer covering or plumage on both avian and some non avian dinosaurs and other archosaurs. they are the most complex integumentary structures found in vertebrates and a premier example of a complex evolutionary novelty.

although we know that feathers cover most part of the body but they arise from certain part of the body or we can say that tract feathers help in flight, thermal insulation and water proofing. also we can see coloration on their body which helps in communication and protection. the study of feathers of birds called plumology.

the feathers are also used in high class bedding especially pillows, blankets and mattresses.

they used to trap the heat.

they used as filling for winter clothing.

feathers of large birds used for making quill pens.

the feathers which we get from poultry farms as waste used in decorations and they are coloured to give more attractiveness to it because poultry feathers are somewhat dull.

Types of feathers:

1. wing feathers

2. tail feathers

3. contour feathers

4. semi plume

5. down feathers

6. filoplume

7. bristle

Structure of feather:

the typical feather consists of a central shaft (rachis) , with serial paired branches (barbs) forming a flattened, usually curved surface, the vane . the barbs posses further branches - the barbules and the barbules of adjacent barbs are attached to one another by hooks, stiffening the vane.

functions of feathers:

1. flying

2. help the body to keep warm

3. control body temperature

4. protecting from wind, moisture and sun

5. help in swimming and diving

6. help in floating

7. have speciality snowshoeing

8. quality like toboganning

9. bracing

10. feeling

11. hearing

12. making sounds

13. muffling sounds

14. foraging

15. helping to keep a steady supply of food

16. eating

17. keeping clean

18. aiding digestion

19. constructing nests

20. transporting water

21. escaping from predators

22. sending visual signals

23. camouflage.

Literature survey:

So our topic was feathers of different birds.

There are so many articles and journals we can find on this topics.

There are articles and journals about how feathers were the reason for some diseases like psittacosis, how some feathers of birds were responsible for flu virus in human beings.

It was also found that many feathers have organic pollutants residues and powdery substances in them.

They can used as samples for sex determination by extracting nucleotide sequence or DNA from feathers instead of blood.

Still there is so much to research is going on for identification of new species, new diseases or how they can be useful to human grace.

Objectives:

Some of the research reports and observations are not based on data analysis on some topics of feathers.

So in future there is so much to explore and we will have more detailed information regarding feathers of different birds.

Scope:

We can identify the birds species through genetic analysis of naturally shed feathers.

On this there are many surveys did by the researchers.

We can describe and identify the structure of feather.

We can name and identify different types of feathers.

We can find new diseases in birds and also new species.

Key vocabulary:

Feathers, rachis, barbs, barbules, vane, quill, calamus, flight, wing, tail.

Materials:

Sample of the feathers more than one of different birds.

Hand magnification lenses(30x,40x).

Methods:

We can collect feathers directly after slaughter of bird.

We can collect feathers of birds when they naturally shed.

For this project we have collected samples of feathers of birds like

1. Columba Livia domestica(feral pigeon)
2. Grus leucogeranus(white Siberian crane)
3. Anas platyrhynchus domesticus(indian runner bird)
4. Pavo cristatus(peahen)
5. Lophura nycthemera(silver pheasant)
6. Nymphicus hollandicus(weiro bird)
7. Milvus milvus(red kite)
8. Dinopium javanense(common golden back)
9. Nucifraga caryocatactes(spotted nutcracker)
10. Corvus splendens(house crow)
11. Coracius benghalensis(Indian roller)

The samples were collected from the places manjeera wild life sanctuary,Malkapur,zaheerabad,Tandur, Telangana.

Sample1:

Pigeon:

Common name: feral pigeon

Scientific name: columba Livia domestica

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order: columbiformes

Family: columbidae

Species: Livia

Subspecies: domestica

General characteristics:

Feral pigeons comparing to original wild rock dove have similar shape and size but the difference is they have greater color variations in plumage and in pattern too. They have darker plumage as they are mostly found in urban areas like towns and cities around the world.

They are also called as city doves, city pigeons or Street pigeons.

They are originally bred from the wild rock and they naturally inhabits sea cliffs and mountains.

They are mostly found in Nandi hills, biligirirangan hills and also in lower elevations of the western ghats of India, Asia, north Africa and Europe. They are 32-37 cm long.

They have 64-72 cm wing span.

They have distinctive twin black wing bars and white lower back feathers.

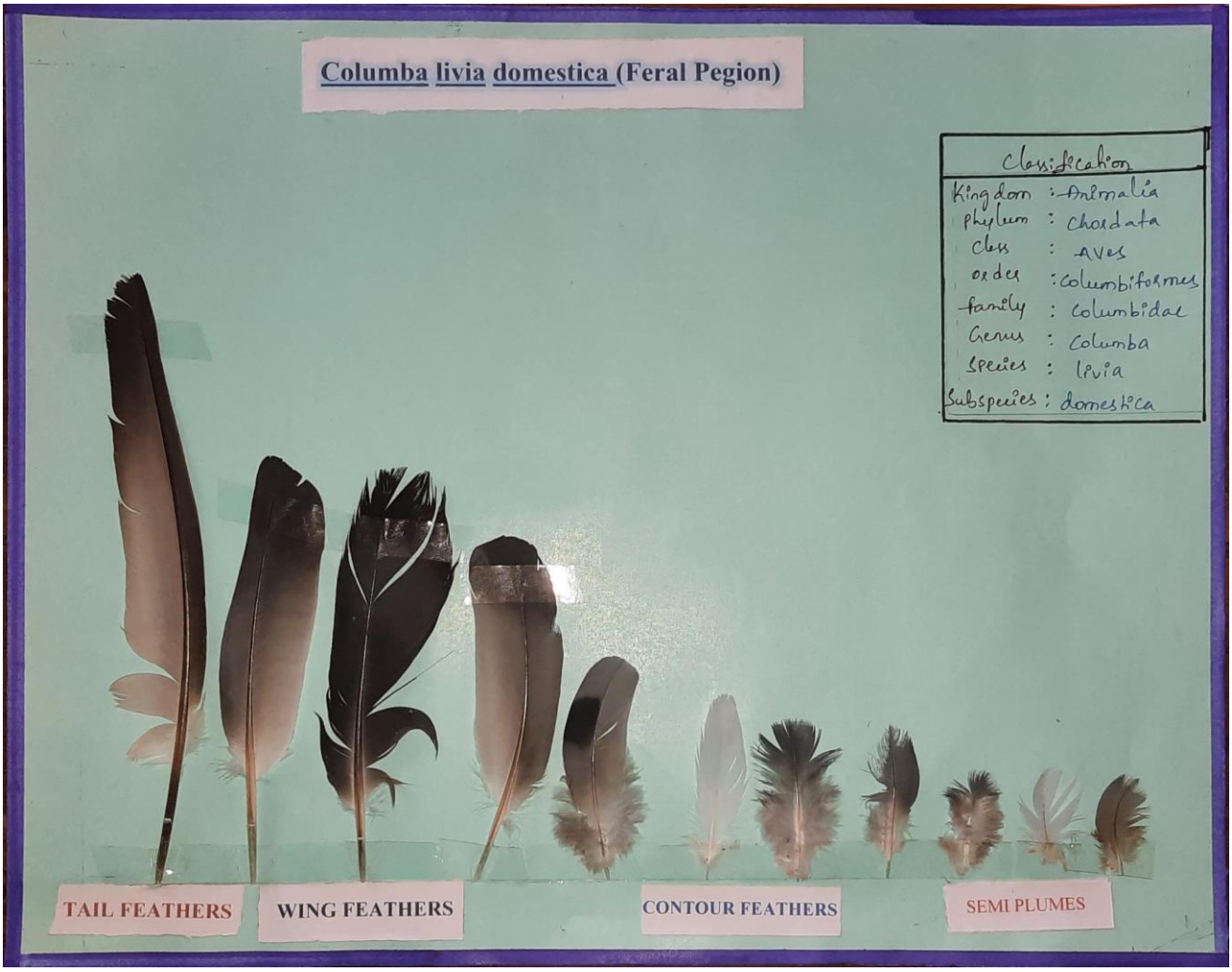
Life span is 35 years nearly depend on environmental factors.

They carry diseases that are harmful to humans. The most common disease is psittacosis. It is stated that more than 40 diseases can be passed to humans.

They can cause more damage to buildings and monuments.

They have 315 different species out of which 10 species found in india like columba Livia rustica etc.

Structure of feathers:



Columba Livia domestica feathers (Fig:01)

We found sample of feathers from Wing , tail ,counter feathers found on General Body.

We also observed that feathers were all over the body and it was having dark plumage.

Contour feathers:

As you can observe here in this feather we have a central axis main stem or scapus and an expanded distal portion the vexillum or vane.

Scapus (main stem):

It is divided into two parts mainly

A. calamus and

B. upper shaft or rachis

A. calamus

It is Hollow tubular in shape and semi-transparent

Its base is fitted in a follicle of the skin and from that follicle some non striated muscle fibers passes to feather and that fibers provide ability to contour feathers to move.

Calamus opens below with the help of small opening called inferior umbilicus.

From this opening it receives a dermal papilla which is small conical and nutritive from the dermis.

So these nutrients and pigment help the feathers for the development.

On the ventral side of the feather near the junction of calamus and rachis there is another opening called superior umbilicus.

B. rachis

The second part is rachis which is above calamus.

It is present longitudinally along the length of the vane.

It is solid its shape is opaque roughly quadrangular in transfer section and it has closely attached mass of pith cells.

Inside the rachis on the ventral side or inner surface the longitudinal furrow and umbilical groove runs along its length.

2. vane(vexillum):

If we observe the rachis have a fan like webbed or broad membranous as part of the feather that is called as vane.

Because of the rachis vane is divided into two unequal halves we can see like it has a proximal end and a distal end.

Proximal end is broader than distal end.

So vane structure is consists of series of several around 600 thread like structures are present called as barbs or rami which are narrow parallel closely spaced delicate and Lateral.

These barbs arise from the two lateral sides of the rachis.

So generally if we see contour feathers we can observe that the size of the barbs decreases from both the ends of rachis.

How the barbs are attached to rachis in the same way there are small delicate and filamentous structures called barbules are attached to it.

We can see 2 types of Barbules

1. Proximal barbules: the face towards the base of feather

2. Digital barbules: the face towards the tip of the feather.

If we see them carefully the lower end of distal barbules have minute barbicles or hooklets whereas the upper ends of proximal barbels are deeply curved to form groove.

Interlocking arrangement:

In this arrangement the grooved edges of proximal barbules and the hooklets of distal barbules are bind together and there will be a sliding moment between them with this arrangement all the barbs and barbules are loosely held together so that the feather would be flat flexible firm wide and continuous surface for striking the air during flight.

This mechanism can be broken down to separate them and can be joined Again by bringing the whole feather.

Wing feathers:

Based on the location with pigeon feathers are divided into remiges rectrices and tetrices.

Remiges:

The feathers are attached to the anterior extremity and form wing.

They are not symmetrical they are used to fly.

We have primary wing feather 42 Right, Left primary wing feather 41.

Tail feathers:

The tail feathers are also called as flight feathers.

The flight feathers are incorporated into the uropygium.

In the tail feathers the is the bulb of the red retrices.

The tail feathers retrices attached to the fused caudal vertebrae or pygostyle.

There are 12 retrices that function primarily in steering and braking during flight and also balance.

Components of tail:

Skeleton, joints, intrinsic, extrinsic musculature, vasculature and innervation.

The tail Apparatus functions are defecation, respiration and vocalization.

Significance:

It is stated that the feathers have metal concentrations either they are washed or unwashed.

The feather samples were collected into different regions one site with higher anthropic activities and the other side with low anthropic activities.

The results were Pb, Cr ,and Cd metals deposited in the feathers.

Those metals were originated from air and soil called exogenous process.

Some other metals like cu,fe, mn and zn which are present in tissue constitution of a living being were present or found.

These metals entered pigeons body through diet called endogenous process.

It observed that metal concentration values were higher in anthropic areas.

So the conclusion is metal concentration values depend on how much they are exposed to exogenous sources.

The higher exposure to exogenous sources the higher will be the metal concentrations in the feathers either they are washed or unwashed.

Lead metal concentration in feathers will be high if its concentration is high in atmosphere that is urban areas.

In rural areas the feather's will have Lead but in less concentration compared to urban areas feathers of pigeon.

The lead concentrations were also found in liver but there was less difference between Urban and rural pigeons.

It indicates that lead concentrations in pigeons whether the main source is atmosphere .

By using this pigeons feather sample we can know the organic pollutants present in it.

Mini organic pollutants like polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs), polycyclic aromatic Hydrocarbons(PAHs), organophosphate pesticides(OPPs) and pyrethroids(PYRs) were found in feather sample of 71 feral pigeons. These were collected from asturias and Galicia of Spain.

These organic pollutants are harmful to humans as well as for environment because of the toxic properties.

We can find differences in organic pollutants concentration in feathers based on age, location and gender.

One of the research states that the coloration of Iridescent and Melanic feathers depend on the exposure to pollutants.

They can fly at 6000 feet or more height.

They can fly between 600 hundred miles in a single day.

They fly at average speeds of up to 77.6 mph but they have recorded flying at 92.5 mph.

Sample2:

White crane:

Common name: snow crane or siberian white crane

Scientific name: grus leucogeranus

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order: gruiformes

Family: gruidae

Genus: grus

Species: leucogeranus

General characteristics:

They are thin and white birds are of height 1.4 M and they have wingspan of 2.1 to 2.3 m.

Their weight is 4.9 to 8.6 kg.

Adults are recognized by their white plumage with the exception of primaries as they are black.

They are located on the fore crown ,fore head, face and side of the head is a featherless cap that is brick red in colour.

This cap is absent in young cranes in place of the cap they have feathers and their plumage is cinnamon in colour.

They have reddish or pale yellow eye colour and reddish pink legs and toes.

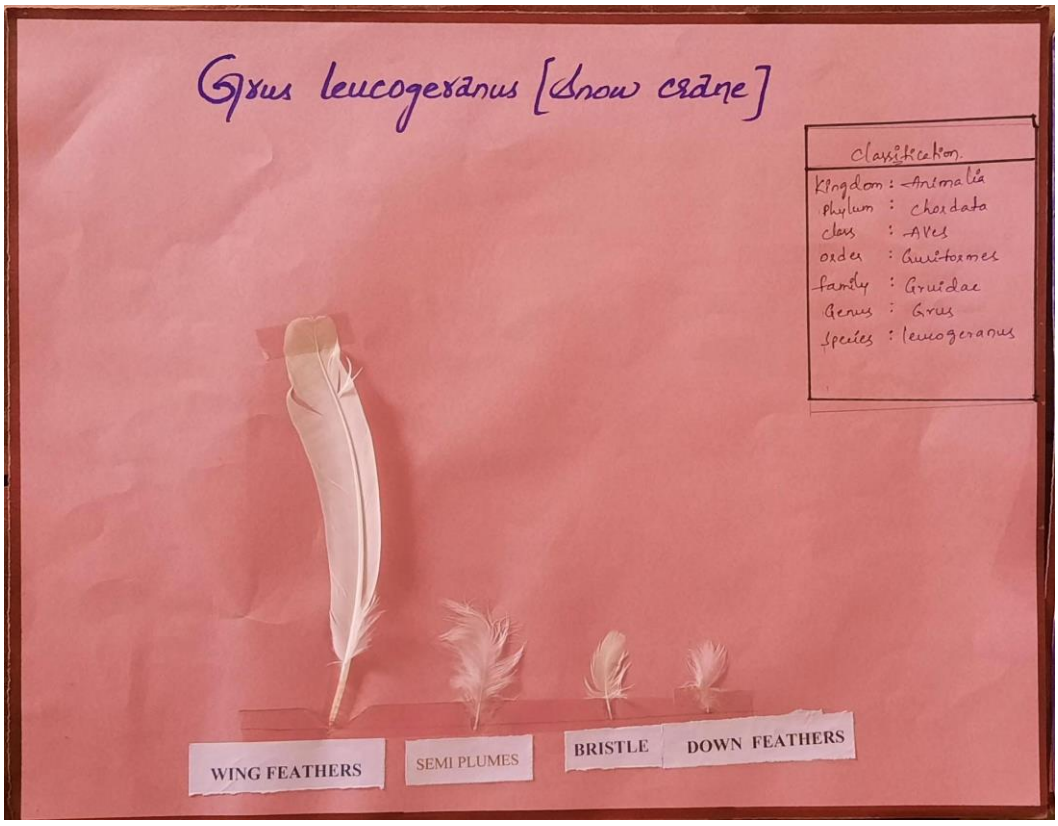
There are less differences between males and females but males are slightly larger than females.

Only one unique character is present that is serrated bill by which we can differentiate between males and females.

They mostly found in the central region on the basin of kunovat river in Russia.

In India they are present in many states and parks.

They have 15 species like Grus paradisca, grus japonensis, grus americana, grus Virgo, grus carunculata, grus nigricollis, grus monacha, grus pagei.



Grus lucogeranus feathers (Fig:2)

Structure of feather:

We found sample of feathers from neck and wing region like contour feathers and down feather.

Contour feather:

It has shaft(rachis), barbs(rami) and the barbules (radii) with hooklets (hamuli).

These all together forms the part of the vane (vexillum).

It is stated that the barbs which are present in the contour part of the vane has three keratinized layers they are medulla ,cortex and cuticle.

Again the cuticle barb is divided into three layers they are epicuticle exocuticle and endo cuticle.

We can find in adult cranes the medulla is fully developed in the barbs of the contour part of the contour feather vane.

Medulla completely covers the central part of Barb and provide circular air cavities which are surrounded by the walls of keratinized cells.

That air cavities contain a gas mixture which help the bird lightness and thermal insulator functions of the plumage.

The size of the medulla depends on the diameter of Barb ,thin walls will have only single layer of medulla where as thick barbs will have multi-layered of medulla.

Multi layered medulla have Vesicular and reticular structures which provide mechanical strength to internal skeleton.

Down plumage:

They are all over the body.

After hatching in 2 to 3 days they reach to ultimate size.

In the plumage structure we can find natal,mesoptile and juvenile generation feathers.

Significance:

A dark pigment is present which gives strength to the structure of the feathers in most of the white Siberian crane primary feathers.

This pigment also helps in improving their effect on long migration.

In this the inner secondaries are elongated so when the feathers are fold they produce the prominent tail.

After the post breeding period they become flights because they loss main flight feathers.

So these feathers help the cranes to flight for the longer time in air.

It has stated and proved that there is residues of organochlorine pesticides in the feathers of white Siberian crane.

So the information tells us that 51 feather samples were collected from the breast, tail and Wings of Siberian white crane and Oriental white stocks at hefei wild animal park in may ,2007.

The researchers used environment- determination of methyl Mercury gas chromatography technique was used to determine it.

They found that pp'-DDD, pp'-DDE, pp'-DDT, betaBHC , gama BHC were present in the feathers of white Siberian crane.

Pp'-DDD reduces 0.5685, 0.5077 and 0.4657 mu/g dry weight the feathers of white Siberian crane.

These residues were found in the breast, contour feathers,plum and tail feathers.

Some other users are also there like sex identification can be done by using non destructive sampling method.

In this method feathers were collected from white Siberian Crane to extract genomic DNA.

They considered three combinations of primers were used to amplify the EEE.6 sequence.

So the male Birds were with only one distinct amplified band but females detected with two bands so later this PCR technique for sex identification of white Siberian crane was successful.

Sample3:

Cockatiel bird:

Common name: weiro bird

Scientific name: nymphicus hoollandicus

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order: psittaciformes

Family: cacatuidae

Subfamily: nymphicinae

Genus : nymphicus

Species: hollandicus

General characteristics:

This bird have different crest which changes its position based on the emotional state.

It has long tail feathers half of its total length like 32-33 cm..

It is the smallest of the cockatoos

The cockateil's which are normal grey or wild type have grey plumage with white flashes on outer edges of each wing.

Male face will be Yellow or white whereas female face is grey or light grey.

Male and female can we differentiate by a round Orange Area on both of their ears called as Cheddar cheeks.

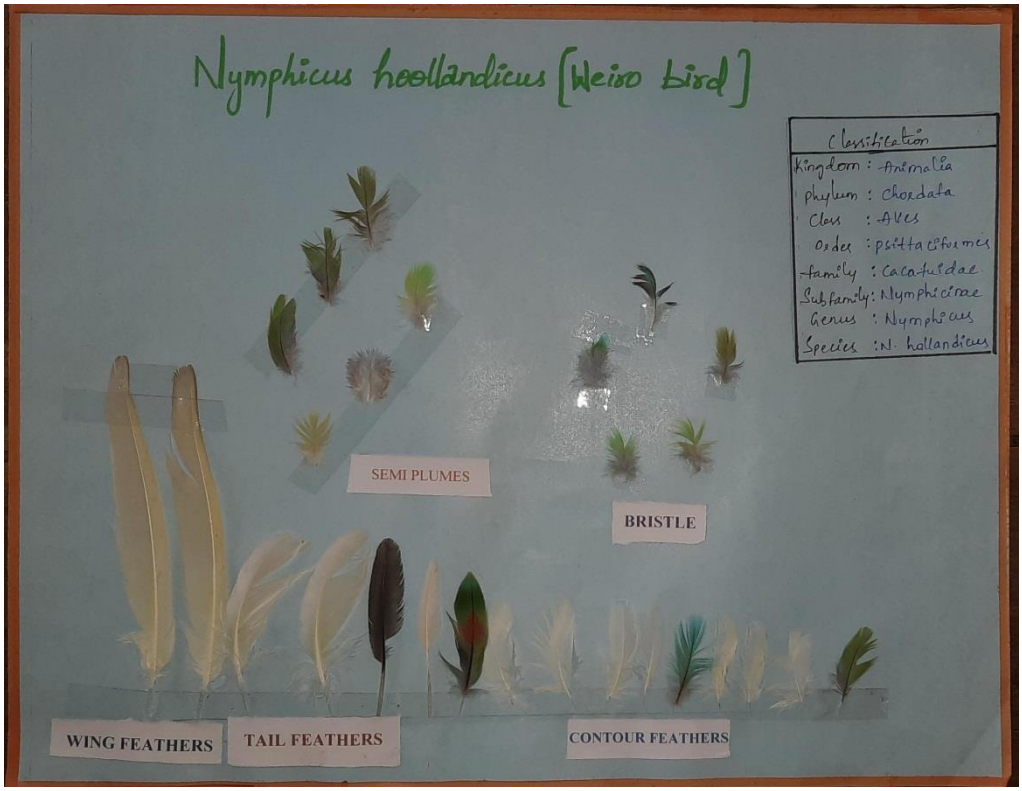
They are the only member of this genus.

They are native to Australia and they are always close to water.

Their lifespan is nearly 16 to 25 years sometimes 10 to 15 years.

The oldest confirmed bird lived up to 36 years old.

Structure of feather:



Nymphicus hollandicus feathers (Fig:03)

We found samples of feathers from neck ,tail and wing regions and also crest feathers.

Tail feathers:

They have a pointed tail.

Its length will be 15 cm half of its body length.

During flight, these tail feathers spread out in the shape of wide fan.

The feathers will be elevated at a particular angle so that they can provide a particular altitude and stability to the bird.

The tail feathers which are inside have more Complex colour than rest of the body.

The tail feathers are barred and are 12 in number called retrices.

Crest feathers:

Crest feathers position is changed according to its emotional state.

These feathers found there and protect the birds eye and cut down on turbulence when it flies.

Contour feathers:

Contour feathers are divided into two categories they are body feathers and flight feathers.

Flight feathers are the longer feathers which are in wings and tail.

Control feathers have erector muscles they can raise and lower feathers to trap a and regulate body temperature.

These same feathers are moved by using erector muscles.

Flight feathers on Wings are called remiges and they give Birds lift when flying.

The functions are helps in steering braking and maneuvering.

Bristles:

The small feathers around eyes ,nostrils and beak called hypopenns.

They protect the bird and have sensory functions which detect air moment.

Near to the follicle of contour feathers there are bristle like feathers called filoplume and they respond to pressure when flying and they are present on all feathers but absent in wing and tail flight feathers.

Down feathers are also present which are small, light and fluffy and they form an undercoat beneath covert feathers.

Their function is they insulates birds body by trapping air in between feathers and skin.

Semiplumes are also Insulating feathers.

Their shafts are soft and flexible.

They also have powder down feathers which form a white powder made out of keratin.

They waterproofs feathers.

Significance:

In this species psittacine beak and feather disease is the most common viral infection.

But there was no evidence so some of them conducted survey on Cockatiel Birds.

The found out that all the birds were free from virus by polymerase Chain Reaction technique and haemagglutination assay.

There were no detectable antibody titre by haemagglutination-inhibition assay.

They have not stopped here, they sequenced the genome of to bfdv isolates.

The sequence obtained from deceased Cockatiel feathers.

They performed cross-reactivity on the sequences using virus obtained from these feathers and Sera from naturally immune psittacine birds.

After all the serological cross reactivity results and phylogenetic analysis of the sequence they proved that the Cockatiel bird virus samples were serologically and genetically different from those beak and feather disease virus in these birds.

Some of them did experiment on sex determination in nymphicus hollandicus bird without harming it.

The results will be obtained by DNA analysis.

The genes which are responsible for sex-determination were preserved which are present on z and w sex chromosomes.

The intron regions of the chdz and chdw genes are different between male(zz) and female(ww).

The DNA sample was extracted from feathers not from blood.

The genes were treated with sex specific primers (p2 and p8).

PCR products were seen through agarose gel electrophoresis.

The results were like individuals showing double bands(zw) are identified as females and individuals showing single bands(zz) are identified as males.

There was found that feather Dystrophy in an 8 year old Cockatiel on physical examination.

They observed multiple, nodular dystrophic feather shafts.

The problem was solved by antibacterial therapy.

But no specific agent was found so they suspected that feather Dystrophy was caused by unidentified bacteria.

Sample 4:

Silver pheasant:

Common name: silver pheasant

Scientific name: lophura nycthemera

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order: galliformes

Family: phasianidae

Genus: lophura

Species : nycthemera

General characteristics:

The male silver pheasant and generally will have a large black crest purplish -Black under parts and upper body parts are light and they have mixture of black brown and white colour body lines.

The females are in brown colour. They have darker crest tail and under parts are in plain Brown.

Females have bright Crimson legs.

Like this we can differentiate between sexes because the population is not in large number.

These birds mostly found on healthy grounds which are covered with forest, bamboos are the area with isolated trees whose height is up to 6000 or 7000 feet.

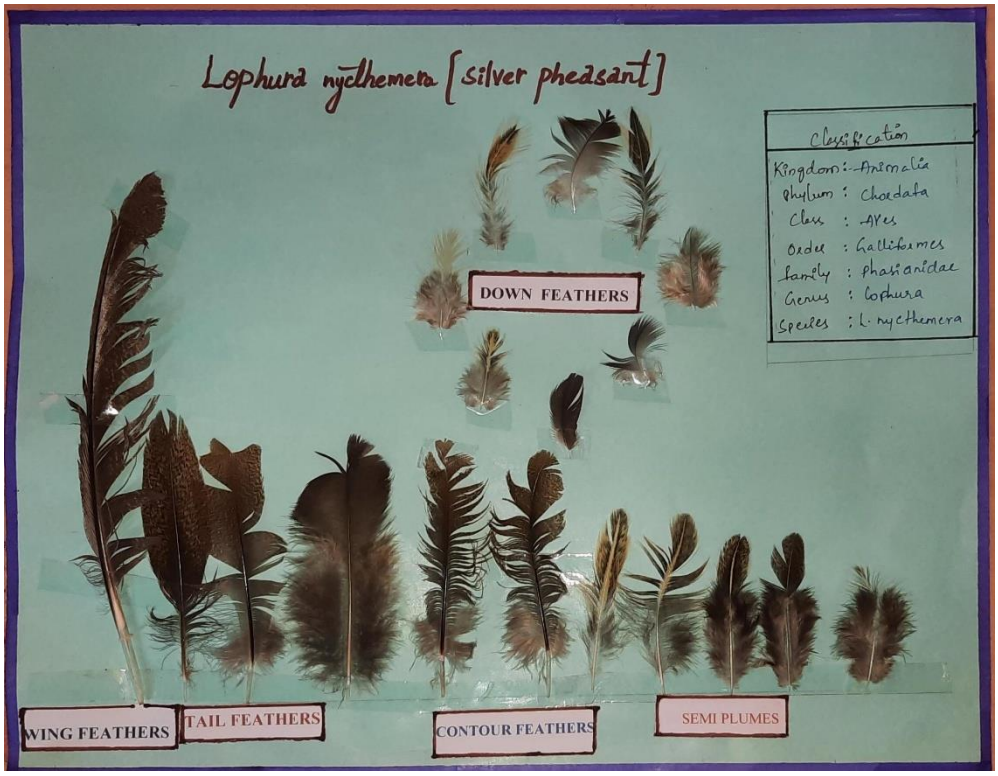
This is the main Habitat this species are absent in open and cultivated country, Plains and marshes and also from high mountain regions.

The populations of these species are geographically is separated by the ecological Terrains which are not suitable and also by some large rivers.

There are 15 species which are found based on the information from the specimens collection of the museums of New York, Washington, Chicago etc. and collected by Jean delacour.

Some of the species are lophura nycthemera nycthemera, lophura nycthemera beaulieui, lophura nycthemera jonesi etc.

Structure of feather:



Lophura nycthemera feathers (Fig:04)

Contour feathers sample were found from the bird lophura nycthemera.

Contour feathers have two types of feathers

Feathers with hooks

Feathers without hooks

Show the feather has branch like structure and that branch has branchlets.

Along with the hooks we have Cilia too.

The branch without hook is abdomen and its number and shape are the main features.

The feathers have nodes.

The knot width, the composition of plume, the length of the not the diameter of the Knot and the shape of the plume together forms the main features.

There are feather plumes on flying feathers and feather branches arising from feather shaft and arranged in an angle less or close to 45 degrees.

The feathers of different parts are spaced from each other.

The feathers with hooks and without hooks are tightly attached together to form a strong feather Piece while some of them are loosely attached and loose.

Significance:

They have highest impact on their native ecosystems.

They have taken silver pheasant as an sample left in a place called isla Victoria Island.there

They established successfully.

This study is done to know how much impact silver Pheasant make in this Island in terms of abundance and related to human disturbance.

The results were like the place with more disturbance have the more population of silver Pheasant.

It means if there is population they can bring increment in their population number.

Der length 55-125 cm,top speed 72 km/he, weight 1-2 kg,life span 15-20 years.

Sample 5:

Peahen:

Common name: indian peafowl or blue peafowl

Scientific name: pavo cristatus

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order: galliformes

Family: phasianidae

Genus: pavo

Species: cristatus

General characteristics:

Female Peacock also called as peahen.

We can differentiate between male and female based on their size of their tail train and plumage colour all over their body.

Peahens are not as beautiful as peacock they have soft brown chesnut plumage, a metallic green neck and a distinct head crest.

That time they have just two species they are Indian or blue peafowl and green peafowl.

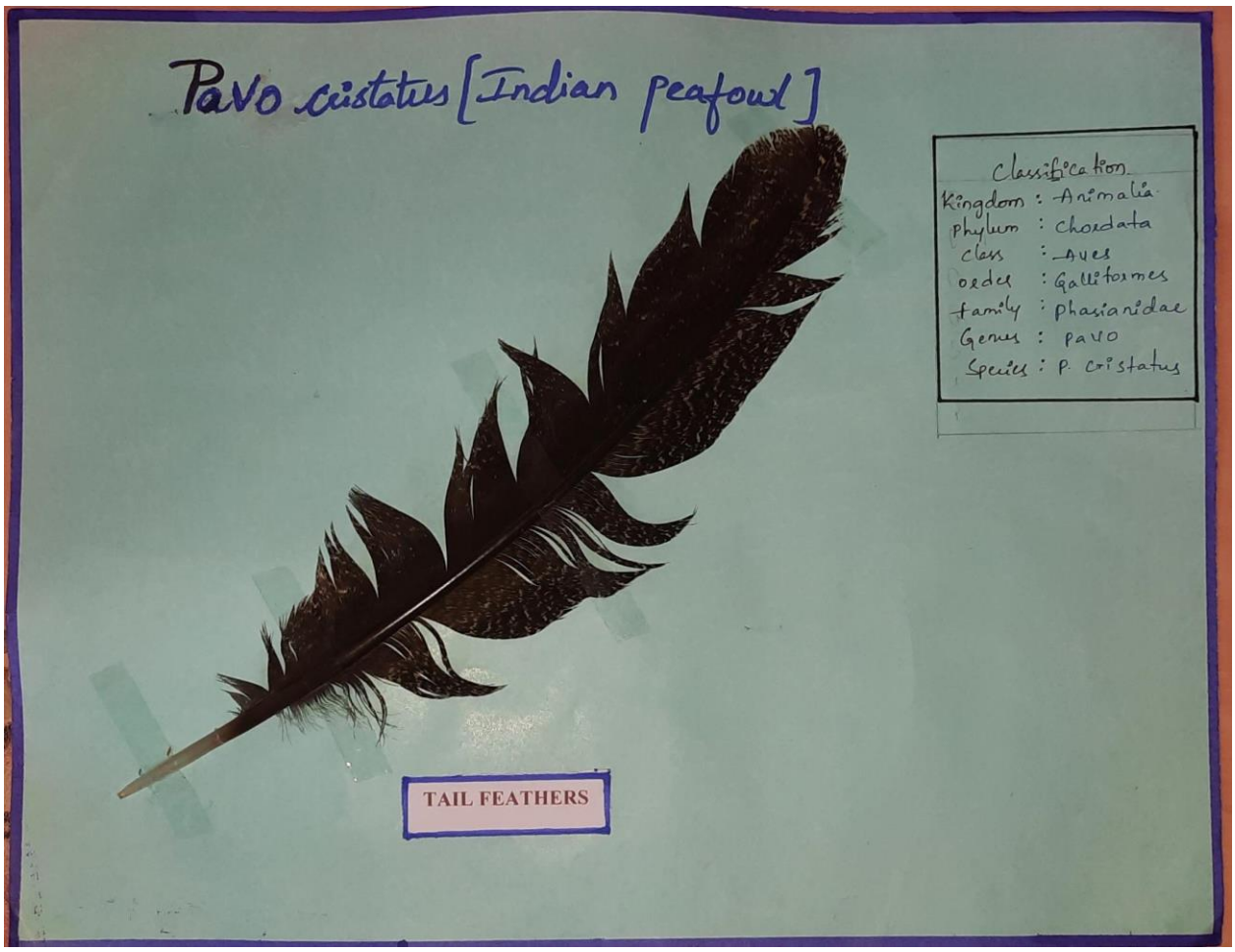
But now there are 225 varieties are there in which US is leading.

They are ground dwelling Birds.

They have lightest brown tail feathers.

They are native to Asia and Africa.

Structure of feather:



Pavo cristatus feathers (Fig:05)

We found sample of peahen tail.

It has not much detailed tail feathers and they are found in neutral or camouflaging

Colours.

They have only a few coloured feathers on their body .Female Peacock have cream, Brown and tan colours.

Which help them in Survival mechanism.

The plain colour feathers help them in camouflage.

In female the Crown feather is 4-6 cm.

The length of flight feathers is 25-35 cm.

In female we have crown feather, Neck feather ,dorsal or back feather, contour feather, flight feathers, tail feather and breast feather.

The length of neck feather, back feathers, contour feathers, tail feathers and breast feathers are 2-4cm, 3-5cm, 2-10cm, 35-45cm,4-6cm.

Crown feather:

They are in group at top of the head and called crest feather.

The crest is formed by 12-15 spatula tipped feather.

They are in fan-shaped along the central axis at the top of the head.

They are brown in colour.

The rachis end in a flat fan shaped, triangular structure with black colour dome at the Centre which is surrounded by royal blue colour.

Neck feathers:

In this the basal part of the weather ie plumaceous and the rachis is covered with fluffy brownish barbs.

The apical region and in vibrant blue barbs

Which have widespace.

The end of rachis is having semicircular green band of barbules which are widely spaced and blue in colour.

The neck region ends with breast ,the width of green tinge increases, from there blackish green barbules arises which are closely spaced compared to apical ones.

Back feathers:

The basal part overlaps the apical part of two different feathers.

In dorsal feather the rachis is covered with brown white barb which forms a brown dome shaped structure.

The apical part of rachis is green in colour.

At the tip the barb has a brown coloured structure that surrounds the bright green barbules.

Contour feather:

These are present above the wings they are Pennaceous in nature.

They have a feather shaft and Flat shaped vane.

They have a pattern of alternative arrangement of creamy orangish Brown and black latitudinal stripes.

In small feather the stripe width is more but in long feathers the stripe width is small.

Flight feathers:

They are collectively called the remiges.

They are divided into primary and secondary during the flight.

The primary flight feathers are black in colour and 9 to 10 in number.

The rachis is having barbs on its either sides and hooked with each other.

The secondary flight feathers are Orange in colour and six in number.

In both of them the calamus is Flat, thick and hard.

Tail feathers:

They are brownish grey in colour and are covered by the decorative extended upper covert feathers and T- feathers.

Breast feathers:

They are on the upper side of down feathers.

They are semi plumes , pennaceous and plumaceous in nature.

They are light, fluffy and white in colour.

Rachis have barbs on either sides of equal length.

Rachis is flexible and thin in nature.

Significance:

The feathers of these birds have multi functioning and multi Optimization.

The flight feathers major functions are and Aerodynamic function, a fail-safe function and a lightweight structural function.

The Aerodynamic function enables the bird to increase the efficiency of flapping by making the wing mainly push the air down.

Optimal fail-safe mechanism function gives high level of Reliability in the wings of a bird.

The feathers contain keratin, steel and Aluminum. So the keratin feather is very efficient from a structural point of you despite the fact that it can perform three functions which are very complex.

Sample6:

Common flameback:

Common name : common golden back

Scientific name: dinopium javanense

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order:piciformes

Family: picidae

Genus: dinopium

Species: javanense

General characteristics:

It is three toed woodpecker.

Male bird have a bright red crest.

Female bird have a black crest with white streaks.

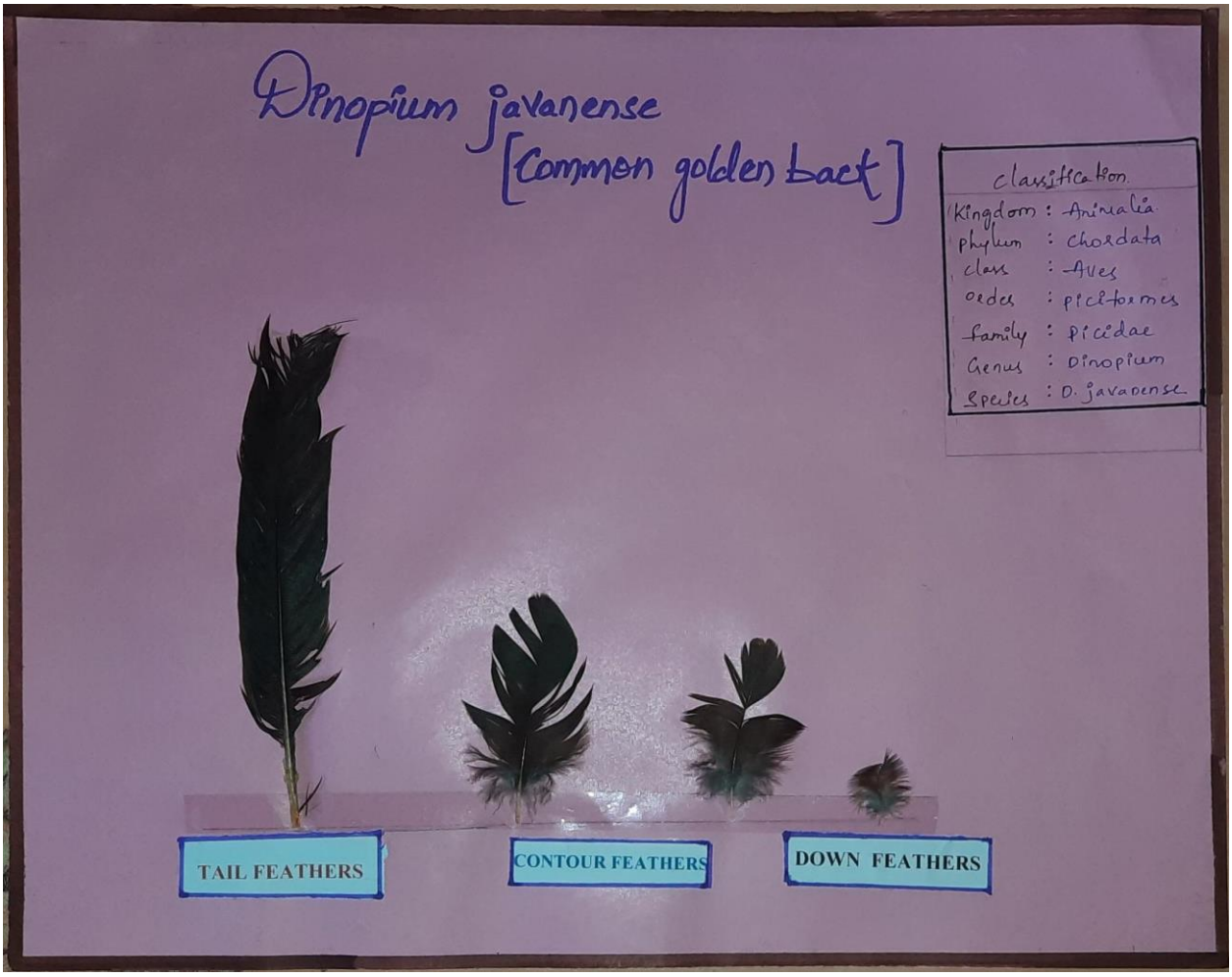
In common both of them have white supercilium,white check stripe and white throat area .

They are all separated by black stripes on upper side and white stripes underside.

They mostly found in South and southeast Asia.

It has 4 species and six subspecies like dinopium javanense javanense, dinopium javanense malabaricum etc.

Structure of Feather:



Dinopium javanense feathers (Fig:06)

The feathers samples are collected from wing, tail and neck regions.

Adult male has bright plumage.

Hind neck and the upper mantel are blank in colour.

The rest of the upper parts are olive and golden.

The feathers with yellow edge but sometimes they are red or orange.

Tail feathers:

It is black in colour.

The uppertail coverts are tinged olive.

Flight feathers:

They have blackish brown in colour.

They have white spots on inner webs.

They have secondary and tertial flight feathers which are having olive yellow outer webs.

On the underparts of the body, the background is white and have tipped black feathers which have scale effect. They make heavy marking on the breast.

The lower underparts are barred not scaled.

They underwing is brown in colour and have white spots.

The undertail feathers are blackish brown in colour.

Contour feathers:

These feathers covers most of the surface of the bird.

Streamlining it for flight and frequently waterproofing it.

Down feathers:

The basal portion of the bird have down feathers useful for insulation.

Significance:

The feathers are also called ornamental feathers.

They make sounds while the bird is taking off or flying or landing.

It indicates that it is warning for other birds to escape from potential threats.

Sample7:

Spotted nutcracker:

Common name: Eurasian nutcracker/ nutcracker

Scientific name: nucifraga caryocatactes

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order: passeriformes

Family: corvidae

Genus: nucifraga

Species: caryocatactes

General characteristics:

It is a passerine bird larger than The Eurasian Jay.

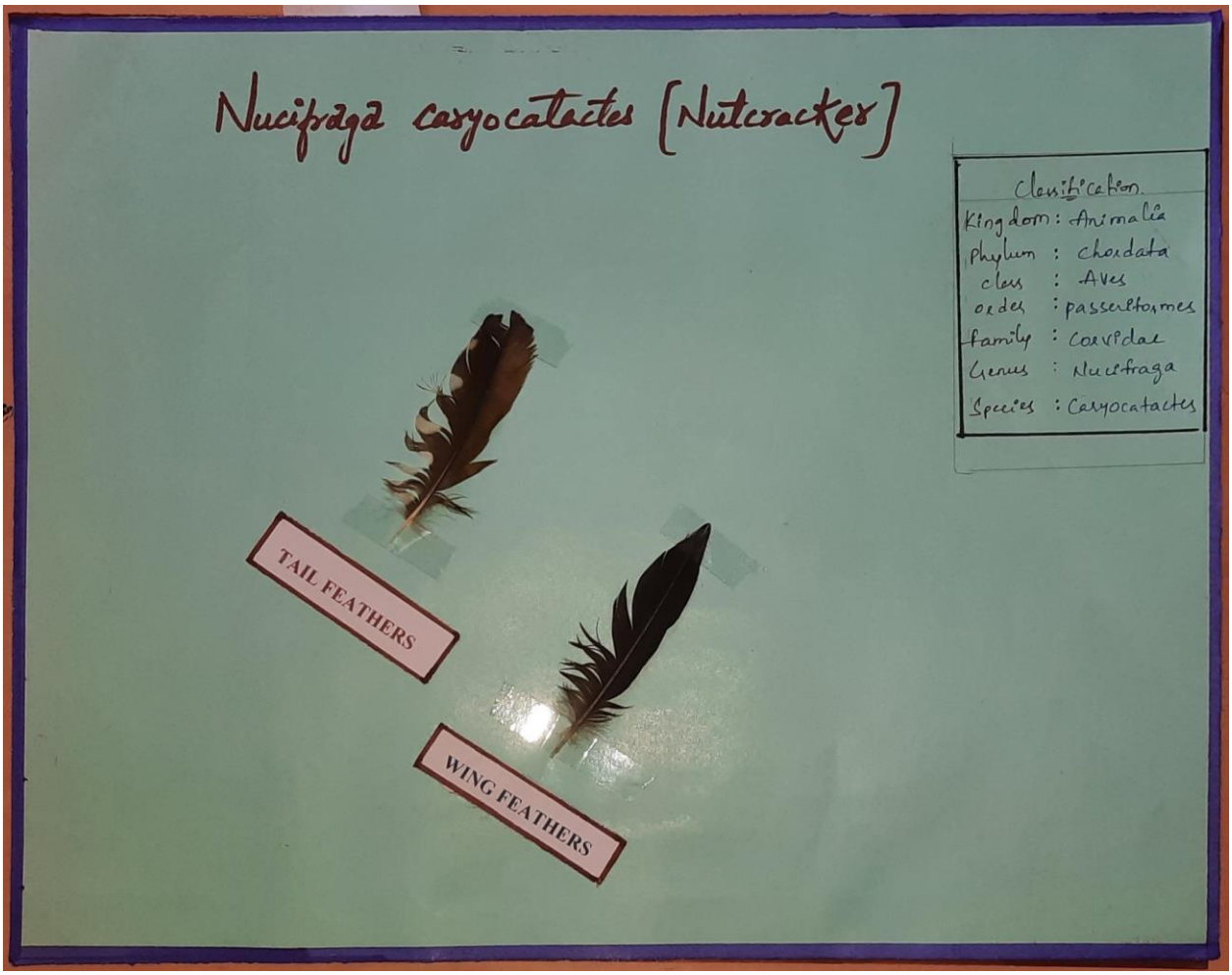
It has larger bill and slimmer head which does not have any crest.

The feathers are present all over the body which have white spots and streaks.

They are mostly found in western North America ,Europe, Siberia, Japan.

They have nine Subspecies like nucifraga macrorhynchos, nucifraga interdicta, nucifraga owstoni etc., found in different parts of the bird.

Structure of feather:



Nucifraga caryocatactes feathers (Fig:07)

It’s wingspan size is 182-272 cm.

Wings:

They are short rounded and have feathers.

Tail feathers:

Tail is long.

Vinod that still have flight feathers which plays an important role in flight.

It has less jerky flight.

It flies high openly in the air with flattering and sleepy hesitant wing-beats.

This bird also has neck feathers, back feathers, tail feather ,Wings feathers, contour feathers.

Contour feathers:.

They are present all over the body

The tip of the feather of bird which are exposed to air are waterproof.

Contour feathers on the wing called coverts.

These coverts smoothening the regions where the flight feathers attached to the bone.

Wing feathers:

They are important for flight at high altitudes.

They are having window poor surfaces or vanes and a central shaft.

Central shaft have barks and barbules which are tightly attached to each other called interlocking arrangement.

Significance:

The melanin is present in the distal bulbs are barbules.

Melanin is responsible for the plumage coloration and produce Brown or black colours.

Because of this melanin we get glossiness in feathers and also iridescence colours.

Medicines colours are produced only by Distal barbules.

This character is related to the evolution.

Sample 8:

Common name : Indian Runner Bird

Scientific name: anas platyrhynchos domesticus

Classification:

Kingdom: animalia

Phylum : chordata

Class: aves

Order: anseriformes

Family:anatidae

Genus: anas

Species: platyrhynchos

Subspecies: domesticus

General characteristics:

They have wedged shaped head.

It bill blend into the head smoothly.

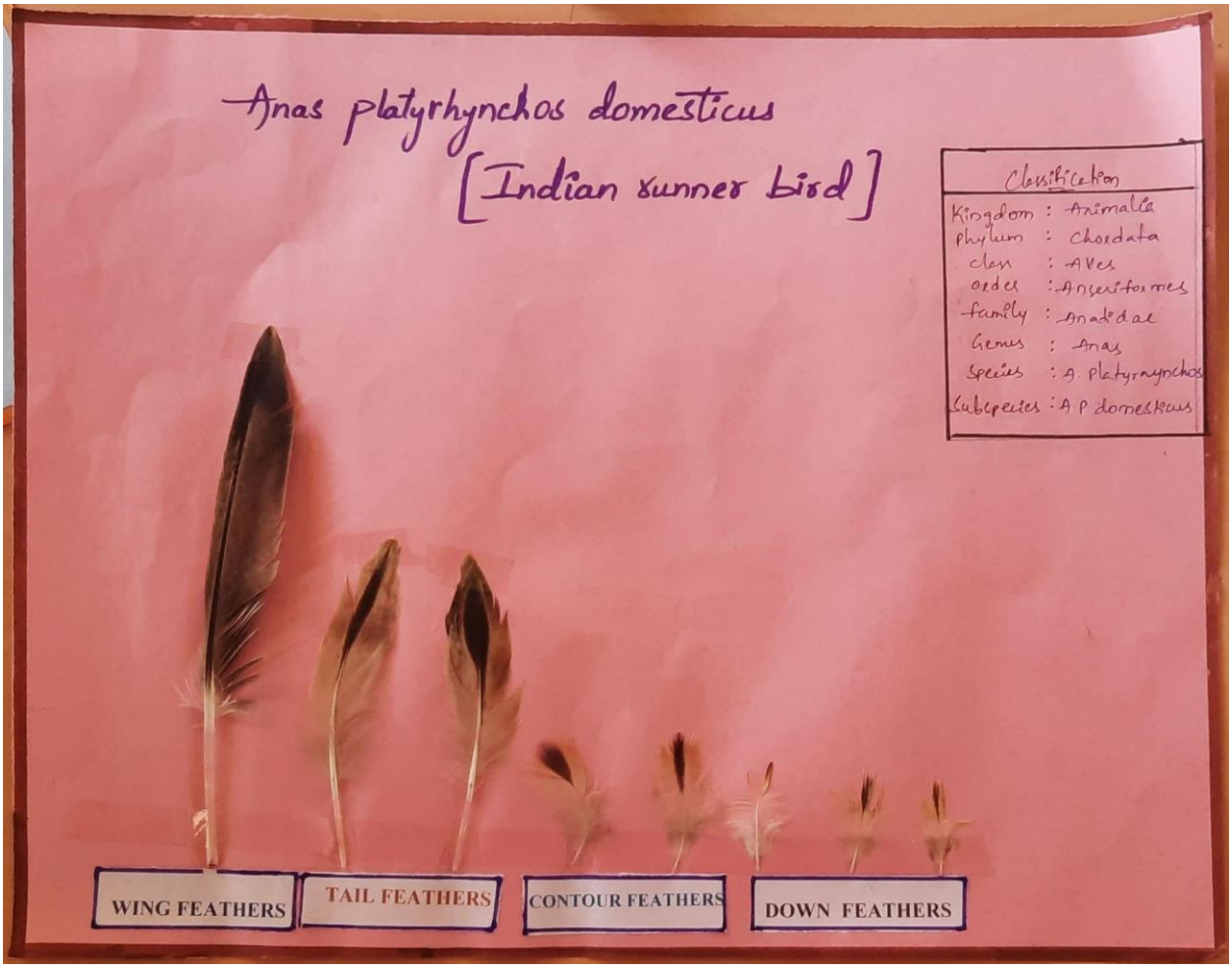
It seems like straight from neck to skull back.

It gives racy appearance to it as a breed trait.

The eyes on the head present it high placement.

The mostly found on the Indonesian Islands of Lombok, java, bali and sold in markets as egg layers or for meat.

Structure of feather:



Anas platyrhynchos domesticus feathers (Fig:08)

Breast feathers are present which are reddish brown in males and brown in females.

Tail feathers:

In males, the center tail feather is curled but in females ,the center tail feathers are straight.

It has primary flight feathers and secondary flight feathers.

Contour feathers:

These are present all over the body.

Their tips will be waterproof as they are exposed to air.

These contour feathers which are present on the wings called coverts.

These coverts will smoothening the regions where the bone and flight feathers got attached.

Wing feathers:

These feathers are used for flight.

This feathers have Central shaft which have barbs and barbules which are hooked to each other.

This is called interlocking system in feathers.

Significance:

This bird feathers are multifunctional.

They have multifunctional Nano structures in the neck feathers.

There is an experiment on the analysis on micro climatic conditions within the plumage of birds.

There are amino acid sequences are present in barbs of feather.

They play an important role in thermoregulation, communication and flight because the damaged feathers can reduce the changes of performing these functions.

These feathers carry feather degrading bacteria on their plumage.

These bacteria degrade feathers.

The moult technique has suggested to defend from those bacteria.

Down feathers:

They are small, soft, fluffy and they are present under the contour feathers.

They have many non interlocking bulbs.

They protect the bird from heat and cold.

They are called powder down feathers.

Semi plumes:

They provide aerodynamics and insulation functions.

They play an important role in courtship displays.

They have rachis which is large but they loose plumaceous vane.

Bristles:

They have stiff rachis with only few barbs at the base.

They are present near eyelids, nares and mouth.

They are sensory and protective in function.

Sample :9

House crow:

Common name: house crow, Indian crow,grey necked crow

Scientific name: corvus splendens

Classification:

Kingdom: animalia

Phylum: chordata

Class : aves

Order: passeriformes

Family: corvidae

Genus :corvus

Species: splendens

General characteristics:

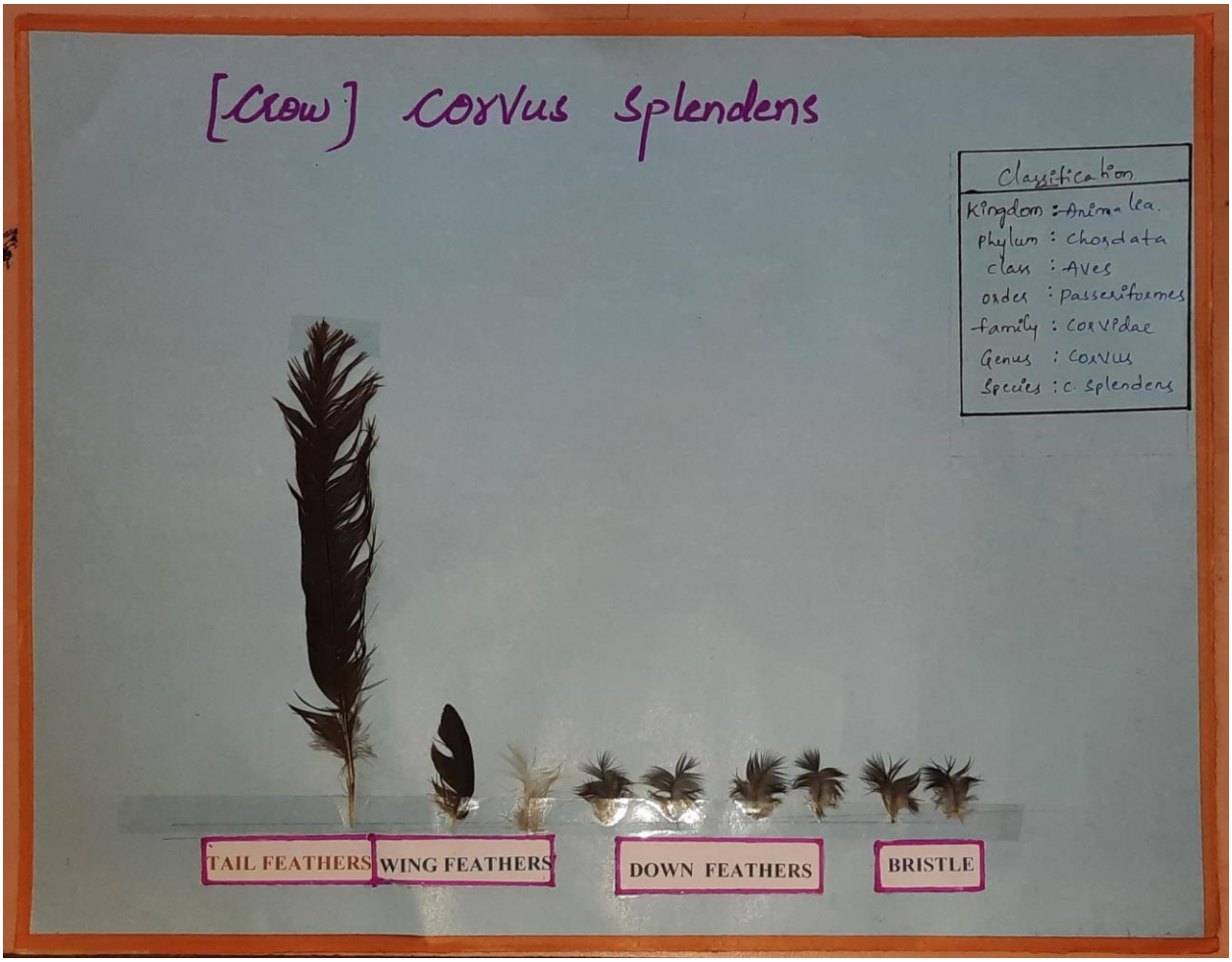
Its fore head, Crown, throat and upper breast are black but the neck and breast are grey in colour.

The wings, tail and legs are also black in colour.

The thickness of the bill and the depth of colour depends on regional variations in the areas of plumage.

They are mostly found in Nepal, India, Pakistan, Bangladesh, Sri Lanka etc.

Structure of feathers:



Corvus splendens feathers (Fig:09)

Tail feathers are elongated and wing feathers folded dorsolaterally.

They have wing feathers, contour feathers, tail feathers, back feathers and flight feathers.

Contour feathers:

They are present all over the body of crow.

The tips of the feathers will be waterproof because they are exposed to air.

Tail feathers:

Tail feathers plays an important role for stability.

Tail feathers have primary flight feathers and secondary flight feathers.

Both primary flight feathers and secondary flight feathers are different in colours.

Significance:

The feather of this bird used as an indicator for heavy metal contamination.

By taking the sample of the feather we can do the sex determination.

For this we can extract DNA or nucleotide sequence from feather.

It is stated that we can get flu virus from its feathers.

Sample 10

Indian roller:

Common name: Indian roller

Scientific name: coracias benghalensis

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order: coraciiformes

Family: coraciidae

Genus: coracias

Species: benghalensis

General characteristics:

The face and throat are pink in colour ,the head and back are brown with blue on the rump and contrasting light.

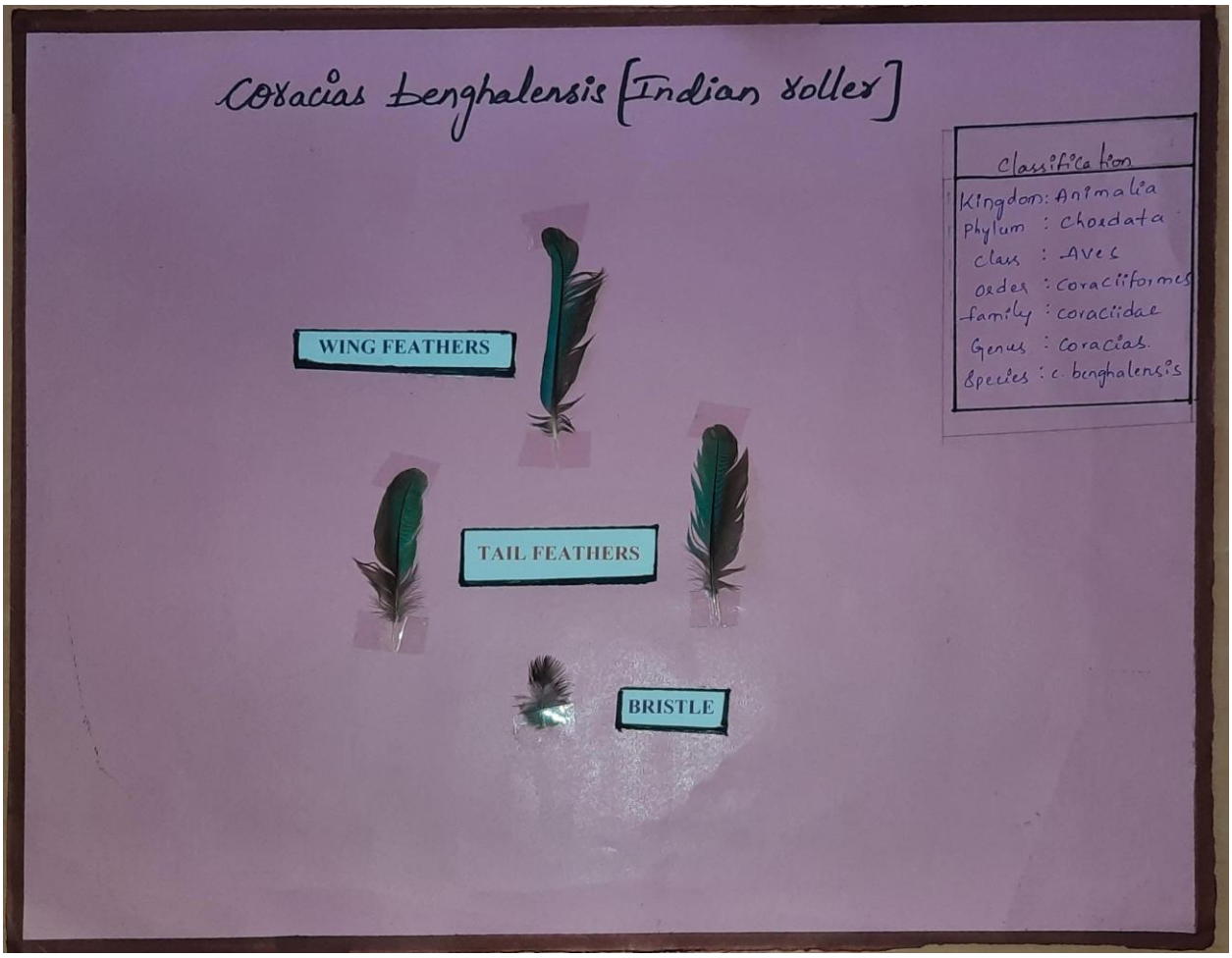
Wings and tail are dark blue in colour.

Wings have bright blue marking.

It has two subspecies.

They are mostly found in West Asia.

Structure of feather:



Coracias benghalensis feathers (Fig:10)

The samples collected from being tail and neck regions.

Wing feathers:

They are used for flights.

Their wing span is 65 to 75 cm.

The number of feathers in wing vary from species to species.

Tail feathers:

There are primary and secondary flight feathers.

Both of them are different in colours.

Primaries are overlapped by secondary flight feathers.

During flight the angle of wingspan changes.

Significance:

The samples of the feathers of these birds are taken to study about zoo therapy for livestock diseases in the Northern leterite Region of West Bengal, India.

These feathers on medicinally important.

Not only feathers, but also can take samples from bone, horn, scale, shell, beak, teeth are used as ethanoveterinary medicine.

Coracias benghalensis 4 subspecies can also be taken as samples.

Sample 11:

Red kite:

Common name: red kite

Scientific name: Milvus milvus

Classification:

Kingdom: animalia

Phylum: chordata

Class: aves

Order:accipitriformes

Family:accipitridae

Genus :Milvus

Species: Milvus

General characteristics:

In this there are two subspecies.

They are Milvus milvus milvus

Milvus milvus fasciicanda

They are mostly found in Africa ,Europe, Iran, Israel, Libya, India and Gambia.

It is a large bird and measures about 62-65 cm in length.

Male weighs 750-1200 grams.

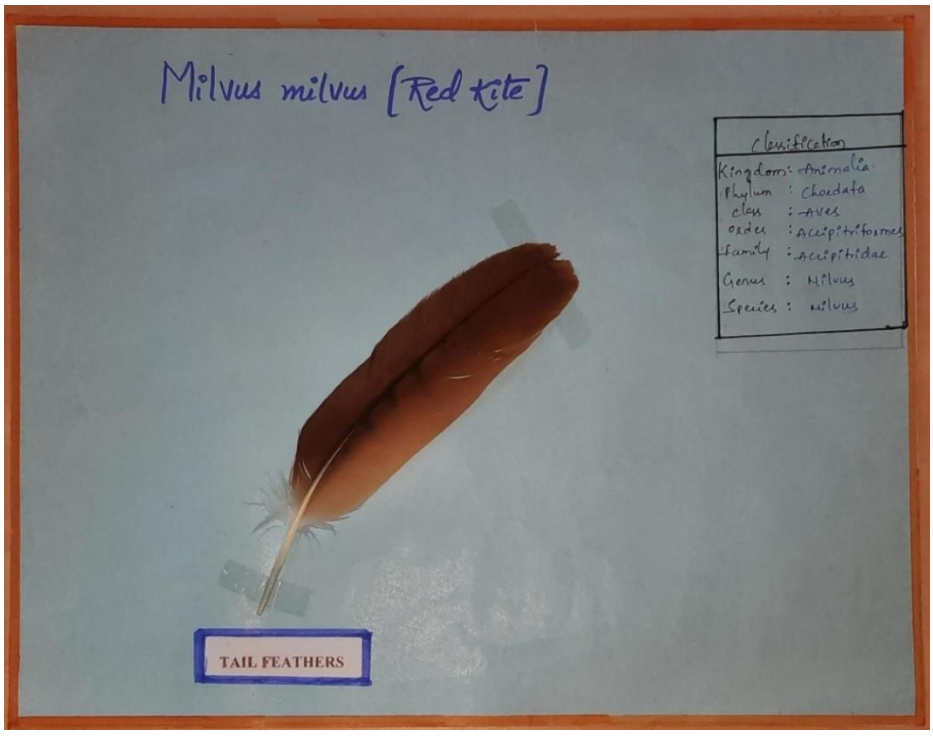
Whereas female weighs 100-300 grams.

Its wingspan is 175-195 cm.

The tail is deeply forked and has reddish colour on top.

Its plumage is Rufous with black breast- streaks.

Structure of feathers:



Milvus milvus feathers (Fig:11)

The sample is taken from wing and tail region.

Wing feather:

The wings are long and held at a dihedral.

Dihedral means upward angle from horizontal in a fixed wing aircraft or birdwing from root to tip.

There are coverts on the wings.

These coverts help in smoothening the region where bone and flight feathers are connected.

The Wink coverts are red in colour so these birds are called red kites.

Significance:

Research done on fathers sample to check which species it is belong to.

We can identify by detecting latent finger marks.

There are many physical and chemical techniques to do it.

To detect latent finger marks on feathers Red and Green magnetic fluorescent powder was used and for eggs black magnetic powder was used to detect latent finger marks on eggs.

Results:

We have collected samples of feathers of different birds belong to different species.

Total we have 11 samples of feathers of different birds. We got different types of feathers in each bird like tail feathers, wing feathers, contour feathers, semiplumes, filoplumes,bristle.

We collected these samples from different areas.

Discussions:

We observed that each and every feather has its own importance .some of sample feathers were bright in colours which were very beautiful to see . Each and every birds feather internal structure was different and their arrangement was also unique and how they are using it so that they can survive in every climatic conditions. Because with the help of feathers they can fly at higher altitudes and they can migrate for breeding, feeding and many other functions.some of the feathers have organic pollutants residues in them. Some of feathers of birds have the audacity to cause flu virus and cause damage to human grace.

Conclusion:

Finally we conclude that we got so much to learn from this project like new species, diseases, types and internal structure of feathers.

Significance of research:

1.we will know about detailed information about feathers.

2.we will know how the feathers are harmful or useful for the environment and human beings.

3.we will also know that how the feathers are useful for birds for their daily activities.

4.we will know that how the feathers help them to escape from predators .

Future scope:

We can research on many subjects related to feathers like their any chemical components in them, new diseases, how the blood circulation occur in feathers etc.

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TARA GOVERNMENT COLLEGE (A), SANGAREEDY

DEPARTMENT OF ZOOLOGY

STUDENT STUDY PROJECT WORK

Comparison of Soil Pollution in Dumping sites in Sangareddy

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Introduction:

Definition :

Soil is the loose surface material that covers most land. It consists of inorganic particles and organic matter. Soil provides the structural support to plants used in agriculture and is also their source of water and nutrients.Soils vary greatly in their chemical and physical properties.

Today, all of us well known the importance of pollution with inside the air or in water contributing to negative fitness. Measures of air fine are regularly said together with our every day weather, and the affects of an absence of get right of entry to secure ingesting water, or of enterprise discharging pollutants into rivers and lakes, are properly documented. In many cases, clean hyperlinks have been drawn among the kinds and stages of unique contaminants in the air or water, and their fitness effects. However, till lately, the affects of soil pollutants on our fitness have had a miles decrease profile. In addition, the technological know-how concerned is complex (Science for Environment Policy, 2012). Researchers are making right development with growing our knowledge of many soil associated problems, which includes soil sealing, erosion and infection, however the affects of soil infection on our fitness aren't as nicely documented. This document goals to start filling this hole in information for selection makers, with a specific attention on providing explanations of the clinical troubles round how soils behave, information of common contaminants in our soils, and what we recognise approximately the ability risks to fitness from soil infection. In a European context, one subject matter of specific issue is citizens' long term, low-stage publicity to a number of soil contaminants, which includes each present day and legacy (historical) emissions. Cases of populations stricken by excessive tiers of soil infection in unique places round the arena were studied considerably via way of means of epidemiologists and toxicologists to apprehend the fitness influences of soil-borne chemical compounds with inside the environment. In those cases, the purpose and impact are regularly surprisingly truthful to determine. However, the effects of dwelling for decades on or close to soils with above-common ranges of infection may be tougher to determine. The examine of soils and human fitness is a complex endeavour: conventional medical tactics that isolate a unmarried variable, including a selected contaminant, after which inspect that variable

aren't powerful on this case, due to the fact some of the problems that have an effect on human fitness contain complex and synergistic relationships (Brevik et al, 2013). This document focuses usually on soil contaminants from human activity, for example, from commercial processes, mining, family/business waste, human and animal pharmaceuticals. It presents an evaluate of modern studies and offers case research regarding heavy metals and artificial natural chemical substances. Soil additionally consists of a extremely good quantity of organic contaminants (e.g. pathogens, which include tetanus, and parasites, including hookworm), which purpose many nicely-documented affects on human fitness. However, those will now no longer be blanketed on this record. Those reading the interactions among soil technology and human fitness come from many educational disciplines, inclusive of chemistry, geology, geography, anthropology, biology, agronomy, sociology, public fitness and medicine. As a result, to gain a clean evaluate of ways soil infection impacts our fitness calls for interdisciplinary teams, and right communique among researchers from different fields. In addition to the clinical challenges, fostering successful interdisciplinary collaboration is likewise crucial if we're to fill the gaps in our expertise of ways the nation of the soil interacts with human fitness. Soil has a profound impact at the fitness and properly-being of humans. Depending upon the situation of the given soil and the interactions of interest, this impact may be both fine or bad and direct or indirect. Soils that have an effect on human fitness consist of herbal soil, which typically has little anthropogenic infection, and soils in agro ecosystems, city areas, mines, oil and fuelling extraction areas, landfill web sites and different places wherein anthropogenic infection is extra likely. People in professions that paintings intently with soil, including farmers, production employees or miners are at a more chance of fitness issues that contain direct touch with soil, however everyone’s fitness is suffering from soil to a few extent. This is due to the fact soil offers some of the vitamins we require and may by skip on dangerous materials thru the meals that we eat. Some dusts generated from soil can journey heaps of miles and have an effect on humans lengthy distances from wherein they originated. Although latest advances with inside the position soil performs in human fitness are being made and remain investigated, few humans in all likelihood consider soil having an impact on their fitness. This paper will deliver a brief, popular review of the subject of soil and human fitness. Other tremendous papers in this subject matter had been posted currently and we inspire the reader to discover extra info on a lot of those subjects in different associated publications .

Soil colour

Soil colour can indicate the organic matter content of soil, the parent material soil is formed from, the degree of weathering the soil has undergone and the drainage characteristics of the soil.

The colour of the soil is the main indicator of how soils drain.

Table 1: Soil colour and indications

Soil colour	Indication
Dark brown	High organic matter content
Black	Humus
Red	• Presence of iron • Phosphorous may be less available to the plant • Free draining
Yellow	• Moist conditions • Restrictive drainage • Less weathering
Grey, Blue/green hues	• Poor drainage • Waterlogging

Lighter coloured soils can generally indicate low fertility for example white sands. While darker soils (like black clays) are quite fertile. There is a large range in between.

Inorganic component of soils

Inorganic material is the major component of most soils.

It consists largely of mineral particles with specific physical and chemical properties which vary depending on the parent material and conditions under which the soil was formed.

It is the inorganic fraction of soils which determines soil physical properties such as texture. This has a large effect on structure, density and water retention.

Sand

Quartz is the predominant mineral in the sand fraction of most soils. Sand particles have:

- a relatively small surface area per unit weight
- low water retention
- little chemical activity compared with silt and clay.

Silt

Silt has a relatively limited surface area with little chemical activity. Soils high in silt may compact under heavy traffic. This affects the movement of air and water in the soil.

Clay

Clays have very large surface areas compared with the other inorganic fractions. As a result, clays are chemically very active and able to hold nutrients on their surfaces. These nutrients can be released into soil water to be used by plants. Like nutrients, water also attaches to the surfaces of clays but this water can be hard for plants to use.

There are many different types of clays. Clays are distinguished from sand and silt by their ability to swell and retain a shape they have been formed into — as well as by their sticky nature.

Chemical properties

The inorganic minerals of soils consist primarily of silicon, iron and aluminium which do not contribute greatly to the nutritional needs of plants. Those in the clay fraction have the capacity to retain nutrients in forms which are potentially available for plants to use.

Organic component of soil

The organic matter of soil usually makes up less than 10% of the soil. It can be subdivided into living and the non-living fractions. The non-living fraction contributes to the soil's ability to retain water and some nutrients and to the formation of stable aggregates.

Organic matter fraction of soils

The organic matter fraction of soils comes from the decomposition of animal or plant products such as faeces and leaves. Soil organic matter contributes to stable soil aggregates by binding soil particles together.

Plants living in soil continually add organic matter in the form of roots and debris. Decomposition of this organic matter by microbial activity releases nutrients for the growth of other plants.

The organic matter content of a soil depends on the rates of organic matter addition and decomposition. Soil microorganisms are responsible for the decomposition of organic matter such as plant residues. Initially, the sugars, starch and certain proteins are readily attacked by a number of different microorganisms. The more resistant structural components of the cell wall decompose relatively slowly. The less easily decomposed compounds, such as lignin and tannin, impart a dark colour to soils containing a significant organic matter content.

The decomposition rate of organic materials depends on how favourable the soil environment is for microbial activity. Higher decomposition rates occur where there are:

- warm, moist conditions
- good aeration
- a favourable ratio of nutrients
- a pH near neutral
- Freedom from toxic compounds.

Soil organisms

The soil contains numerous organisms ranging from microscopic bacteria to large soil animals such as earthworms. The soil microorganisms include:

- bacteria
- fungi
- actinomycetes
- algae

- protozoa
- nematodes.

The diversity of soil organisms can both assist and hinder plant growth. Beneficial activities include:

- organic matter decomposition
- nitrogen fixation
- transformation of essential elements from one form to another
- improvement in soil structure through soil aggregation
- improved drainage and aeration.

Under some circumstances soil organisms compete with plants for nutrients.

Bacteria are the smallest and most numerous microorganisms in the soil. They make an important contribution to organic matter decomposition, nitrogen fixation and the transformation of nitrogen and sulphur.

The fungi and actinomycetes contribute beneficially to organic matter decomposition. The group of large soil animals includes earthworms, which incorporate organic matter into the soil as well as improving aeration and drainage by means of their channels.

Some soil fungi, nematodes, and insects feed on roots and lateral shoots to the detriment of plants.

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Objectives

- I want to know difference between normal soil and dumpyard soil.
- Dumpyard soil is harmful to living organisms or not.
- Weather dumpyard soil is harmful means what impacts will be there to environment and living organism

Materials :

Soil.

Gloves.

Pick axe.

Kjeldahl assembly.

Kelplus assembly.

Colorimeter.

Spectrophotometer.

Flame photometric.

pH meter.

Methods:

Nature of soil :Normal soil and dump yard soil

Determination of Soil Reaction (pH)

Principle

The pH is a measure of the hydrogen ion activity of soil-water system. It indicates whether the soil is acidic, neutral or alkaline in reaction. Since crop growth suffers both under very low (strongly acidic) as well as very high pH (alkaline) conditions, appropriate reclamation measures becomes essential.

pH is the electromotive force or electric potential that develops in between the electrodes (Glass electrode and Calomel electrode) when the electrodes are immersed in test solution is passed to galvanometerthrough resistance.

Instrument : pH meter

Reagents :

Standard buffer solutions: These may be of pH 4.0, 7.0 or 9.2 in pure water or in other ranges of expected pH value. In case of buffer tablets (available commercially), a single piece is to be dissolved in freshly prepared double distilled water and made up to 100 ml. It is necessary to prepare a fresh buffer after every few days, as the solutions do not keep for long, even when stoppered.

pH in Soil-water suspension

- Take 20g of soil in a 100 ml beaker.
- Add 40 ml of distilled water and stir the suspension at regular intervals for about 30 minutes
- Calibrate the pH meter using two pH buffers, one in acidic and the other in alkaline range or neutral pH
- Carefully insert the combined electrode in the suspension and measure pH

Note

- The suspension must be stirred well just before immersing the electrodes and readings are taken.
- Before each determination, the electrodes must be washed with a jet of distilled water and dried with the help of a piece of filter paper or tissue paper.

Soil salinity:

Soil Texture

The texture is qualitatively determined by rapid feel method which involves rubbing the soil between the thumb and fingers. In this procedure proficiency is gained through practice and making comparison with samples of known textural class determined by standard quantitative methods.

Steps for texture determination:

A small quantity of dry soil is moistened with water and mixed thoroughly on a glass or porcelain dish so as to form a soft ball and then worked until stiff and squeezed out between thumb and fore-finger. The feel to fingers, ease of forming ball, stickiness or grittiness, whether forming soil ribbons or merely crumbling on squeezing etc., are observed. The texture is classified as follows (Ghosh et al., 1983).

Mercury coarse texture

Sand :: Very gritty, does not form ball, does not stain finger.

coarse texture

Loamy sand :Very gritty, forms ball but very easily broken, stains finger slightly.

Sandy loam: Moderately gritty, forms fairly firm ball which is easily broken, definitely stains finger.

Medium texture

Loam : Neither very gritty nor very smooth, forms firm ball but does not form ribbon finger appreciably.

Silt loam : Smooth or sticky, buttery feel, forms firm ball, stains and has light tendency ribbon with flaky surface.

Fine texture

Clay loam : Moderately sticky, slightly gritty feel, forms moderately hard ball when dry, stain ribbons out on squeezing but the ribbon breaks easily

Silty clay loam : Same as above but very smooth, shows flaking on ribbon surface, similar to silt

Very fine texture :

Clay : Very sticky feel, forms ball which when dry cannot be crushed by fingers, stainless squeezes out at right moisture into long (2-5 cm) ribbon.

Organic Carbon

Wet Digestion Method (Walkley and Black, 1934)

Principal

The organic matter (humus) in the soil gets oxidized by chromic acid (potassium dichromate and conc (Sulphuric acid) utilizing the heat of dilution of sulphuric acid. The unreacted dichromate is determined by back ting with ferrous ammonium sulphate (redox titration).

Reagents

- 1N potassium dichromate (49.04 g of AR grade $K_2Cr_2O_7$, per litre of solution)

- 0.5N (aprox.) ferrous ammonium sulphate (196 g of hydrated crystalline salt per litre containing20 mlof conc H_2SO_4).This solution is relatively more stable and convenient to work than that of ferrous sulphate
- Diphenylamine indicator: Dissolve 0,5g diphenyl amine in a mixture of 20 ml of water and 100 ml ofcone H,SO,
- Concentrated sulphuric acid (sp.gr.184)
- Ortho-phosphoric acid (85%) (chemically pure)

Procedure

- The soil is ground and passed through 0.2 mm sieve
- Place 1.00 g soil at the bottom of dry 500 ml conical flask (corning/Pyrex) and add 10 ml of 1N$K_2Cr_2O_7$with pipette and swirl a little
- The flask is kept on asbestos sheet. Then add 20 ml of concentrated $H_2SO_4$and swirl again two or three times.
- The flask is allowed to stand for 30 minutes preferably in darkness.
- Add 200 ml of distilled water, 10 ml of ortho-phosphoric acid, ml of diphenylamine indicator andtitrate the contents with ferrous ammonium sulphate solution till the colour changes from blue-violet togreen
- Simultaneously, a blank is run without soil.

If more than 7 ml of the dichromate solution is consumed in titration, the determination must be repeated with a smaller quantity (0.25-0.50 g) of soil.

$$\text{Organic carbon}(\%) = \frac{10(B-T)}{B} \times 0.003 \times \frac{100}{\text{wt. of soil (g)}} \quad \text{(or)} \quad \frac{10(B-T)}{B} \times \frac{0.3}{\text{wt. of soil,}}$$

Where B=Volume (in my of ferrous ammonium sulphate solution required for blank titration, and

T-Volume of ferrous ammonium sulphate needed for soil sample

Note:High chloride content, as in case of saline soils, interferes in the estimation. It can prevented by adding Silver sulphate @ 1.25% to the sulphuric acid .

b) Calorimetric method of estimation (Datta et al., 1962)

The oxidation of soil organic matter is carried out by dichromate-sulphuric acid mixture and thegreen colour of the chromium sulphate formed, is measured to give directly the amount of carbon oxidized

Instrument

Colorimeter or Spectrophotometer

Reagents

- IN(AR grade) potassium dichromate (49.04 g/l)
- Concentrated sulphuric acid (sp.gr.1.84) with 1.25 g of silver sulphate per 100 ml (to avoidinterference) (iii) Sucrose (AR grade), anhydrous

Procedure

- Take one g. of soil (passed through 0.2 mm sieve) in a dry 100 ml flask (Pyrex/Coming)
- Add 10ml of IN$K_2Cr_2O_7$and swirl a little followed by 20 ml of cone sulphuric acid and swirl again
- After keeping for 30 minutes on an asbestos sheet, transfer the contents to centrifuge tube and centre it at 1000 rpm to obtain clear supernatant liquid Alternatively, allow the contents in the conical flask overnight without disturbance (see note at the end of the procedure)
- Read the green chromium sulphate colour of the supernatant layer in the colorimeter after adjusting blank solution (without soil) to zero using 660 nm (red) filter

Calculation

Organic carbon (%) Colorimeter reading (R)x Factor (from standard curve)

Preparation of standard calibration curve

- Take one to 25 mg of anhydrous sucrose (AR) in separate 100 ml dry conical flasks and add 10ml Of $K_2Cr_2O_7$ solution to each followed by 20 ml of conc H_2SO_4
- Swirl the flask a little and set aside for half an hour.
- Then take readings in the colorimeter using 660 nm (red) filter after adjusting the blank to zero.
- Draw a curve plotting the concentration of carbon (in sucrose) on the x-axis and the colorimeter row (R) on y-axis and calculate the factor

Note: Instead of centrifuging (after addition of $K_2Cr_2O_7$ and H_2SO_4 of soil), keep the flasks overnight decant the supernatant solution carefully for colorimeter reading. This avoids the chance of any da to the centrifuge due to accidental spilling of the concentrated acid and a large number of samples handled at a time. The standard curve must be prepared in an identical manner. However, for clayey centrifuging becomes necessary as these do not settle properly for calorimetric measurements.

Estimation of Available (mineralizable) Nitrogen

Alkaline permanganate method (Subbaiah and Asija, 1956)

Principle :

The easily mineralizable N is estimated using alkaline KMnO,, which oxidizes and hydrolyses the matter present in the soil. The liberated ammonia is condensed and absorbed in boric acid, which is titratestandard acid.

Instruments

Kjeldahl assembly (or)

KELPLUS Automatic Nitrogen Distillation Unit.

Reagents

(i) 0.32 per cent potassium permanganate solution: Dissolve 3.2 g of AR grade KMnO, in distilled and make to one litre.

(ii) 2.5 per cent sodium hydroxide solution: Dissolve 25 g of sodium hydroxide pellets in distilled water

make to one litre.

(iii) Liquid paraffin (extra pure)

(iv) 0.02 N sulphuric acid: Prepare approximately 0.IN H,SO, by adding 2.8 ml of concentratedH_2SO_4, toabove ml of distilled water. From this, prepare 0.02 N H,SO, by diluting a suitable volume five timesdistilled water. Standardize it against 0.02 N NaOH solution.

(v) 2 per cent boric acid solution: Dissolve 20 g of pure boric acid powder in warm water by stim dilute to one litre. Add 20 ml of mixed indicator to one litre of 2% boric acid solution. Adjust the 4.5 with dil. HCl or dil. NaOH.

(vi) Mixed indicator: Dissolve 0.066 g of methyl red and 0.099 g of bromocresol green in 100 ml of

Percent ethyl alcohol.

(vii) Glass beads

Procedure (Using Kjeldahl assembly)

- Take 20 g soil in a 800 ml dry Kjeldahl flask.
- Add 20 ml of distilled water followed by 100 ml each of 0.32 per cent KMnO, and 2.5 solutions.
- Prevent frothing by adding liquid paraffin (1ml) and bumping by adding a few glass beads.
- Measure 20 ml of 2% boric acid containing mixed indicator in a 250 ml conical flask and place itthe receiver tube. Dip the receiver tube end in the boric acid.
- Distill the contents in kjeldahi assembly and collect the liberated ammonia into the conical flaskcontaining boric acid solutions. With the absorption of ammonia, the pinkish colour of the indicator turns to blue Collect nearly 100 ate distillate about 30 minutes.
- Titrate the distillate with 0.02 NH50, he or shade (pinkish) starts appearing
- Run a blank without sod

Calculation:

$$\text{Available (Mineralizable) N (kg ha}^{1}) = \frac{(S-B)\ 0.02 \times 0.014 \times 224 \times 10^{6}}{\text{weight of soil taken (g)}}$$

$$= Rx3136$$

Available N kg/acre = Rx 12.7

The Sand B stand for the titre values of sample and blank, respectively and R-(S-B)

Weight of soil taken-20g

Procedure (Using KELPLUS assembly)

- Weight 5.0 g of soil sample into a Macro (200 ml) distillation tube
- Measure and add 35 ml of 0.32% KMnO, and connect it to the distillation unit.
- Measure 20 ml of 2% boric acid containing mixed indicator into a 150 ml conical flask and place it underthe receiver tube. Dip the receiver tube end in the boric acid.
- Preset the time for 6 minutes and alkali (2 5% NaOH) quantity for 35 ml.
- Press alkali addition switch and add 35 ml of NaOH.
- Put on the tap connection for condenser and run the water from outlet continuously for cooling
- Put on the mains and start the instrument. Once the instrument is ready for distillation the bulb glows. Itmay take 15-20 minutes initially to get ready.
- Switch on the timer switch and run the distillation unit for 6 minutes
- After completion of distillation for 6 minutes timer switch goes off automatically. Take out flask from the receiver tube end after the timer switch goes off
- Titrate the distillate with 0.02 NH SO, till the original shade (pinkish) starts appearing
- Run a blank without any soil for 6 minutes after completion of distillation and deduct the blank titreValue from each sample titre value.

Calculation :

$$\text{Available (mineralizable) N (kg ha}^{-1}) = \frac{(S-B) \times 0.02 \times 0.014 \times 2.24 \times 10^{6}}{\text{Weight of soil taken (g)}}$$

$$= R \times 125.44$$

Available N kg /acre = R× 50.7

S and B stand for the titre values of sample and blank respectively and R=(S-B)
Weight of soil taken = 5g

After completion of distillation wash the alkali tube twice or thrice with distilled water.

Estimation of Available Phosphorus In Soil

Olsen's method for neutral and alkaline soils (Olsen et al., 1954)

Principal :

The most widely used extractant is the M NaHCO3, solution at pH 8.5. The reagent is most suitable for neutral to alkaline soils and is designed to control the ionic activity of calcium through solubility product of CaCo3, extracting the most reactive forms of P from Al, Fe-and C-phosphates. The solubility calcium phosphate is eased because of the precipitation of Ca++as CaCO3, Phosphorus in the extract can be determined using suitable method of colour development and measuring the colour intensity at an appropriate wavelength

Instruments

Calorimeter or Spectrophotometer, Mechanical shaker

Extraction of available phosphorus

Extracting reagent

Olsen's reagent: 0.5 M sodium bicarbonate (pH 8.5)

It is prepared by dissolving 42.0 g of NaHCO, (laboratory reagent) in distilled water to give one litre of the calculation .The pH is adjusted to 8.5 with small quantities of 10 per cent NaOH.

Procedure

- Take 2.5 g of soil in 100 ml conical flask, add a little of Darco G 60 charcoal powder (free of phosphorus) followed by 50 ml of Olsen's reagent.
- Run the black without soil.
- Shake the flasks for 30 minutes on a platform type shaker and filter the contents immediately through filter paper (Whatman No. 1) into a clean and dry beaker or vial.

- Estimate the phosphorus calorimetrically by Watanabe and Olsen procedure

Note: The activated carbon (even if marked phosphorus-free) is likely to contain traces of P which having removed by repeated washings with Olsen's reagent followed by warm distilled water. The sample should test free of phosphorus when extracted with Olsen's reagent. The sodium bicarbonate should be free from any phosphate contamination

Estimation of Available Potassium:

Principal

Potassium present in the soil is extracted with neutral normal ammonium acetate solution. The ammonium get exchanged by K' ions that are adsorbed on soil colloids and K+ ions get into the soil solution. The concentration of these K ions is determined by feeding the filtratedirectly to the flame photometer which reads the density of K ions present in the sample.

Instruments

Flame photometer, Mechanical shaker and pH meter

Reagents

- Neutral normal ammonium acetate: Dissolve 154 g of ammonium acetate in 500 ml distilled water and makeup to two litres. Adjust the pH of this solution to 7.0 with acetic acid or ammonia solution
- Potassium chloride solution: Dissolve 1.907 g of AR grade potassium chloride (dried at 60°C for 1 hr) in distilled water and make up to 1 litre to give 1000 ppm K stock solution.

Procedure

- Weigh 5 g of soil in a 100 ml conical flask.
- Add 25 ml of neutral normal ammonium acetate solution and shake for 5 minutes.
- Filter it immediately through a dry filter paper (Whatman No.1).
- Measure potassium concentration in the extract using flame photometer after necessary setting and calibration of instrument.

Standard curve for potassium

- From the 1000 ppm K stock solution, take 1, 2, 3, 4, 5 and 6 ml in 100 ml volumetric flask with ammonium acetate solution to give 10 to 60 ppm of K
- After placing appropriate filter and adjusting the gas, record the flam photometric readings blank to zero and60 ppm K to 100 reading. The curve is obtained by plotting different areas(10, 20, 30, 40, 50 and 60 ppm) of K on horizontal axis against the flame photometer readings on vertical axis. Any fluctuation in gas or air pressure does not allow steady reading in the measuring be taken care of.

Calculation

Available K,O (kg ha)

$$= Rx \frac{\text{Volume of the extract (25)}}{\text{Weight of soil taken(5)}} \times \frac{2.24 \times 10^6}{10^6} \times 1.2 = R \times 13.44$$

where R- ppm of K in the extract (obtained from standard curve)

Available KO (kg/acre) = Rx 5.44

Note:

- If the reading of the extract exceeds 100 it is better to dilute and take the reading against to the concentration with dilution factor.
- The filtrate should be clear in order to avoid choking of capillary tubeof the flame photometer occurs frequently.
- Potassium standards should be prepared fresh after every 2-3 weeks.

Results :

Fig 01 : Collecting of dumpsite soil. **Fig : 02 Image of Dump site area**

Fig :03 Collecting of Normal soil Fig : 04 Image of Normal soilarea

Fig :05 Dumpyard soil Fig : 06Normal soil

Fig : 07 Making drying of Dumpsite soil

Fig : 08 Making drying of Normal soil

Fig 09 : Testing of pH

Fig 10 : Testing of Salinity index

Fig 11 : Testing of organic carbon

Fig 12 : Testing of Available Nitrogen

Fig 13 :Testing of Available phosphorus potash

Fig 14 : Testing of Available

Normal soil :

Sl .no	Parameters	Values
01	pH	7.65
02	Salinity index	0.29
03	Organic carbon	0.4
04	Available Nitrogen	106.6
05	Available phosphorus	13.1
06	Available potash	308.6

Dump yard soil:

Sl .no	Parameters	Values
01	pH	8.51
02	Salinity index	1.14
03	Organic carbon	1.0
04	Available Nitrogen	87.1
05	Available phosphorus	22.7
06	Available potash	327.6

The Use of NPK.

In many parts of the world, the soil used to plant crops or grow flowers often lacks one or more of these essential nutrients. In order to help plants to grow, farmers or gardeners can add these nutrients back into the soil. Because of its widespread availability, manure can be added to the soil to help provide these nutrients. Manure refers to organic matter collected from composting or animal feces.

Aside from manure, plant fertilizers are also commonly used to help provide plants with essential nutrients to help improve health, growth, and crop yield. NPK is often used as a fertilizer due to its combination of three essential nutrients:

- nitrogen
- phosphorus
- potassium

Each of these micronutrients affect plant health in different ways.

Discussion:

From the above results Normal soil and dumpyard soil the parameters soil of pH , salinity index , organic carbon , Available Nitrogen , Available phosphorus , Available potash these all parameters results were different and but they were not more impact to environment.

Conclusion:

Based on results we can conclude that the parameters pH , salinity index , organic carbon , Available Nitrogen , Available phosphorus , Available potash these are more in dumpyard soil than the normal soil and these are not harmful to environment and these are helpful for environment to provide high yield crops and helpful for animals for eating of plants and by this soil does not become a pollute the soil will become more nutrients and helpful for environment.