

SRI SATHYA SAI COLLEGE FOR WOMENS ,BHOPAL

FIELD PROJECT REPORT ON *COLLECTION AND IDENTIFICATION OF LOCALLY AVAILABLE SEEDS AND THEIR DISPERSAL MECHANISM*



SESSION 2022-2023

SUBMITTED TO
DEPARTMENT OF BOTANY

GUIDED BY:-
DR. RENU MISHRA
MS.SUPRIYA GUPTA



SUBMITTED BY:-
DIMPLE KHAIRWAR
BSC 2nd year

DECLARATION

I hereby declare that I have completed my project work (1st December 2022 to 5th February 2023) on the topic **“Collection And Identification Of Locally Available Seeds And Their Dispersal Mechanism”**.

This field project is my original work in which the published and unpublished work has been duly acknowledged and used. I also declare that no part of the project has been presented / submitted for any other degree or diploma in any other College or University.

Signature with date : Dimple

Name of the student : DIMPLE KHAIRWAR

Class: BSC 2nd year

APPROVAL LETTER

This is to certified that the present field report has been completed under my guidance. This has been presented in Department of Botany & Microbiology, Sri Sathya Sai College for Women, Bhopal after my approval.

Renu Mishra

Dr. Renu Mishra

HOD, Botany & Microbiology

Date :

Place: Bhopal

ACKNOWLEDGEMENT

Bearing in mind previous I am using this opportunity to express my deepest gratitude and special thanks to our principal Dr. Asha Agarwal for giving us the permission to proceed with our work.

I would also like to thank the HOD of Botany Dr. Renu Mishra and Ms. Supriya Gupta who guided and kept me on the correct path and allowing me to carry out my project at their esteemed guidance and extending during the training.

I express my deepest thanks to Dr. Shikha Mandloi and Dr. Nishi Yadav for taking part in useful decisions and giving necessary advices and guidance and arranged all facilities to make life easier. I chose this moment to acknowledge the grateful contribution of our lab technician Smt. Sushma Upadhyay and Mrs. Seema Sahay and lab attendant Tungum didi.

My thanks and appreciation also goes to my colleague in developing the project and people who have willingly helped me out with their abilities.

THANK YOU



Established in
1974

ॐ श्री साई राम

OM SRI SAI RAM

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Re-Accredited



NO.: SSSC \

DATE :

CERTIFICATE

This is to certify that *Ku. Dimple Khairwar* student of B.Sc. II Botany has completed the field project on the topic entitled "**Collection and Identification of Locally Available Seeds and their Dispersal Mechanism**". This work was carried out from December to March 2023 in the Department of Botany & Microbiology, Sri Sathya Sai College for Women, under the supervision of **Dr. Renu Mishra & Ms. Supriya Gupta**.

Ku. Dimple Khairwar is hard working, dedicated and result oriented. She has done excellent work in the institute during the project period. We wish for her bright future.

Date: 29.3.23

Place: Bhopal

Agarwal
29.3.23

Dr. Asha Agarwal
Principal

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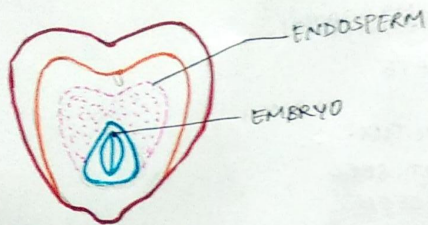
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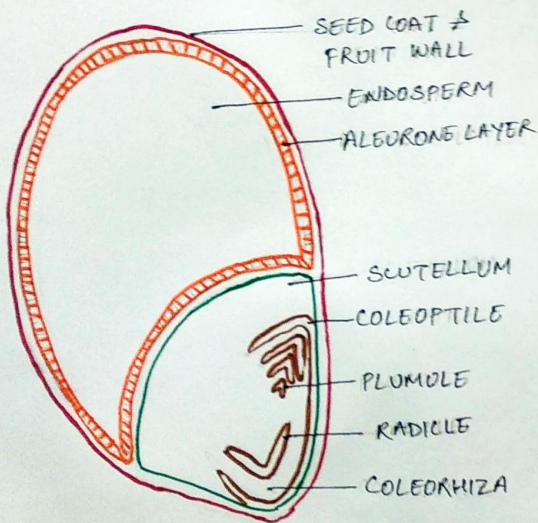
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(A) MAIZE GRAIN



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STRUCTURE OF MAIZE GRAIN

INTRODUCTION

A seed is a mature ovule that comprises an embryo, a miniature undeveloped plant and food reserve all enclosed within a protective seed coat. It is the basis for agriculture, a vehicle or medium for transmission of information from one generation to another.

A seed is a product of ripened ovary. They are a way of reproduction for all flowering plants. Every seed is capable of growing into new plant under proper environmental condition such as right temperature, moisture etc.

There are two types of seeds:

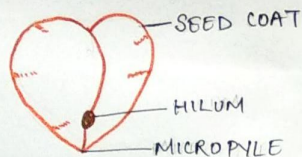
A) MONOCOTYLEDONOUS SEED:

- > This type of seed bear only one cotyledon in their embryo
- > They contain endosperm for nutrition of embryo
- > These are called albuminous seeds or endospermic seeds
- > Some examples are - Maize, paddy, barley, wheat etc. some monocot seeds which are non-endospermic

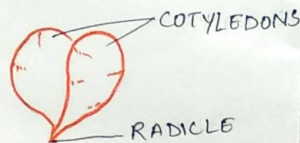
STRUCTURE OF MONOCOTYLEDONOUS SEED

Let's take an example of maize as monocotyledonous seed to study the structure of monocot seeds.

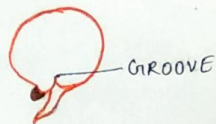
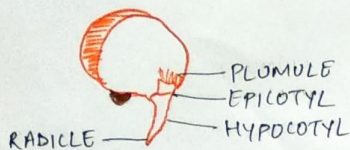
INTRODUCTION



GRAM SEED



EMBRYO



STRUCTURE OF GRAM SEED

- The seed exhibits structural uniformity.
 - Maize grain is not a seed rather it is a caryopsis's fruit in which the ovary wall or pericarp is intricately associated with seed coat.
 - Upper portion is broad and the lower portion is narrow.
 - The integrated seed coat forms the outermost layer.
 - The internal and outer layer is divided into two unequal parts.
 - The outer portion is called endosperm on the margin of which a layer of cells called aleurone is found.
 - The lower lining of endosperm is called epithelial layer which remains attached with scutellum.
 - cells of epithelial layer which remain attached with material stored in endosperm cells are digested by these enzymes and provide energy to the developing embryo.
- Monocotyledonous possess a shoot tip, plumule enclosed in a sheath called coleoptile and root tip radicle enclosed in coleorhiza.

B] DICOTYLEDONOUS SEEDS:

- > seeds contain two cotyledons in their embryo
- > reserved food material is stored in these cotyledon
- > endosperm is absent hence called non-endospermic seed
- > some examples of dicotyledonous seeds are -
Mango, pea, gram beans.
- > some exceptions are castor, Jatropha etc. in which endosperm is present even after maturity.

STRUCTURE OF DICOTYLEDONOUS SEED

Let's take an example of gram seed in dicotyledonous seed

- Outermost thin layer is testa and the inner thin layer is tegmen.
 - The outermost covering of the seed is called seed coat.
 - One end of the seed is pointed. Just below the pointed there is a notch which is called hilum.
 - A pore is found near hilum which is known as micropyle.
- All the parts inside the seed coat constitute the embryo.

The embryo consists of two parts:

i) Cotyledons - thick, fleshy and flat structure in an embryo called cotyledons. These are two in number which is placed lateral to each other. These are joined to with embryonal axis.

ii) Embryonal axis - The part of the axis which is fully covered with cotyledons from the two sides is called Plumule. It forms shoot of plant body after germination.

- Another extremity of the embryonal axis which is placed towards the pointed end of seed and not covered with cotyledons is called radicle. It forms the root.
- The part below the plumule is epicotyl.
- The axis region just below the radicle is hypocotyl.

SEED DISPERSAL

The movement, spread or transport of seeds away from parent plants to the place of germination is called seed dispersal.

Plants have limited mobility and rely upon a variety of dispersal vectors to transport their seeds, including both abiotic vectors, such as the wind, and living (biotic) vectors such as birds.

seeds can be dispersed away from the parent plant individually or collectively, as well as dispersed in both space and time.



ANEMOCHORY

AGENCIES OR SOURCES OF FRUIT OR SEED DISPERSAL.

1. Anemochory or Dispersal by wind
2. Hydrochory or Dispersal by water
3. Zoochory or Dispersal by animals
4. Autochory or EXPLOSIVE dispersal

1. ANEMOCHORY OR DISPERSAL BY WIND

The dissemination of seeds or fruits from parent plant to other places through the agency of wind is called anemochory. It is probably the most common method of seed dispersal.

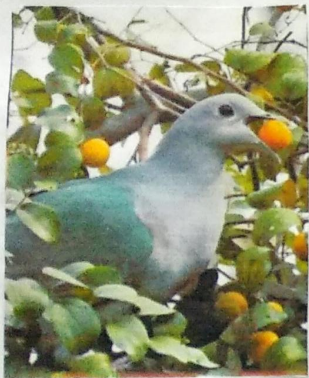
This is found in many species of plants like Moringa, Lagerstroemia, Cinchona etc.

Plants have different adaptations for anemochory

- i) Formation of minute and light seeds - Orchid
- ii) winged fruits and seeds - Eg- Discosia, Polygonum, Moringa, Acer etc.



SEED
HYDROCHORY



ZOOCHORY



AUTOCHORY

1.1) Fast seeds show parachute mechanism - Eg - *Trolox*, *Calotropis*

2. HYDROCHORY OR DISPERSAL BY WATER

The plants which grow along the banks of rivers, ponds, lakes and sea shores, disperse their fruits and seeds by water currents. This type of dissemination of fruits and seeds through water is called hydrochory.

Example - water lily, *Nelumbo nucifera*, coconut, etc.

Adaptation of seed for Hydrochory -

- 1) seeds are light in weight and floats on water surface due to presence of spongy tissue
- 2) presence of mass waxy and slippery surface
- 3) seeds do not decay even for a long period in water.

3. ZOOCHORY OR DISPERSAL BY ANIMALS

The fruits and seeds of plants which are dispersed by animals including human beings is called zoochory.

Adaptations for zoochory -

- 1) presence of organs for attachment like hooks, spines, stiff hairs etc. Eg - *xanthium*
- 2) fruits have attractive appearance, Eg - *solanum nigrum*
- 3) plants have edible fleshy fruits Eg - mango, tomato, papaya etc.

4. AUTOCHORY OR DISPERSAL BY EXPLOSION

Fruits of many plants dehisce or burst with a sudden jerk of internal force as a result of which seeds are dispersed to a little distance.

Example - castor, Balsam, Night jasmine etc.

The explosive mechanism may differ slightly in diff. plants.

- In legumes (pea, Beans) and siliqua (Radish & Mustard), the pericarp dries after fruit ripening and get thickened. Due to minor touch of man, animals, pressure of wind and even automatically, the dried and twisted pericarp dehisce into two parts.
- In plants like *Barbarea*, *Acanthus mollis* etc. on maturity the fruits dehisce into two valves. Just after dehisce of fruits, these become straight and spread seeds at places.

SIGNIFICANCE OF SEED DISPERSAL

1. It maintains the continuity of a species on earth
2. plants are spread on the whole earth surface through seed and fruit dispersal.
3. It saves plants from scarcity of light, space, water and mineral nutrients
4. Rate of survival of newly developed plants is increased
5. plants are able to adapt themselves to different habitats.
6. Dangers to plants through overgrazing and diseases is minimised.
7. Process of evolution fully operates on different populations of plant species.
8. Dissemination of plants on earth is possible only through seed dispersal.

REVIEW LITERATURE

For a plant movement of the seed provides the single opportunity in its entire life cycle to change its geographic location. As the seed is deposited within the seedscape this life cycle event sets the template for all future interactions in a plant's life. (Nathan and Muller, 2000)

The theory that seeds that seem to be adapted to wind dispersal travel much longer distances than seeds that have no adaptation. Flattened and winged seeds were indeed found to be transported farther by wind. The species with wind-adapted seeds were also taller, being an alternative explanation since taller seeds experienced higher wind speeds at greater heights. Seed morphology is not always the best predictor in classifying species in groups w/ distinctly different dispersal ability. [Telenius and Jongejans, 2001]

The seed dispersal effectiveness (SDE) concept, defined as the likelihood of a seed removed by a fruit-eating bird to be dispersed to a suitable site for seed survival and germination, provides the framework to compare the contributions of different birds to seed dispersal.

Some fruit-eating animals only consume the pulp and discard the seeds without ingesting them; thus seeds are deposited close to the mother plant and dropped with adhered pulp remnants, making them more susceptible to pathogens. Once the fruit is removed, seeds can be dispersed to varying distance, where biotic and physical characteristics will affect the successive stages of recruitment, from the survival of the seed on the ground to the establishment of new individual plants. (Wang and Smith, 2002)

REVIEW LITERATURE

Seed dispersal is a critical stage in the life cycle of the species. It transports physiologically independent individuals to the habitat occupied by their parents or to new suitable territories. The unit of dispersal (diaspore, propagule or disseminule) is determined by the embryo, the seed, the fruit or the fruit and the associated parts. Diaspores can be dispersed in space and time. Dispersal in space is the transport from one site to another far from the parent plant. Dispersal in time is the maturity of diaspores for a variable period of time. [Flores et al 2004]

A profusion of fruits forms implies that seed dispersal plays a central role in plant ecology, yet the chance that an individual seed will ultimately produce a reproductive adult is low to infinitesimal. Extremely high variance in survival implies that variation in fruit production or transition from seed to seedling will contribute little to population growth. [F. Howe and N. Mohr, 2004]

Seed dispersal links the end of the reproductive cycle of adult plants with the establishment of their offspring, and is widely accepted to have a profound effect on vegetation structure. Evidence from plant demography research is revealing that seed dispersal might have an important role in determining patterns of tree diversity and distribution. [Benjamin et al 2007]

Seed dispersal is universally considered important for biodiversity conservation. The structure of landscape has strong effects on the distances travelled by seeds, regardless of whether they are dispersed by abiotic factors (wind) or by animals. Therefore any type of disturbance, such as habitat fragmentation or habitat modification by an invasive plant species for instance, is likely to change the patterns of seed movement.

For wind-dispersed species seeds travel much further distances in open landscapes than in dense forests, due to difference in shape of wind profile. Plants depending on animals for seed movement are susceptible to dispersal failure when seed vectors become rare or extinct. [Traveset et al 2008]

Species of fruit-eating birds, a major group of seed dispersers, differ in mobility, habitat requirements, foraging behaviour, size, shape and digestive capacity and all of these factors influence the number of seeds dispersed and the quality of the dispersal service. [Donatti et al, 2011]

In stream geomorphic and hydraulic diversity are important for both seed transport and seed retention in fluvial systems. Woody debris and flotsam are important for long distance seed dispersal, especially for ~~the~~ seeds without specialised phenology. Lateral connectivity between the channel and flood plains, as well as timing of seed release, for example with receding flows influence whether seeds are transported to sites with favourable germination conditions. [Hyslop and Trowsdale, 2012]

Animal dispersed plant species exhibit higher levels of genetic diversity and lack of inbreeding as a result of the stronger genetic connectivity than plant species whose seeds are dispersed by wind or water. [Alton et al. 2021]



Collection of seeds from fruit of Citrus limon



Collection of seeds of Hibiscus pedunculatus

METHODOLOGY

1. Citrus limon

COLLECTION OF PLANT MATERIAL:

Fruit of Citrus limon were collected from college campus. Seeds were extracted from the fruit by cutting it into two half with the help of knife. Seeds were dried in the sun for 2 days and then stored in poly bags.

2. Hibiscus pedunculatus

COLLECTION OF PLANT MATERIAL:

Fruit of Hibiscus pedunculatus were collected from college campus. Fruits were plucked by wearing gloves. Seeds were extracted with the help of forceps and was stored in poly bag.

3. Bixa orellana

COLLECTION OF PLANT MATERIAL:

Fruit of Bixa orellana were collected from college campus. Fruits were plucked by wearing gloves. Seeds were extracted with the help of forceps and was stored in poly bag.



Collection of
seeds from
Bixa orellana



Collection of
seeds from fruit
of Moringa oleifera



Collection of seeds
from pods of
Leucaena leucocephala

4. Moringa oleifera

COLLECTION OF PLANT MATERIAL:

Fruits of Moringa oleifera were collected from Pabel Nagar colony. The fruit was plucked from the tree with the help of a bamboo stick. The seeds were extracted from the fruit by cutting it longitudinally with the help of knife. Seeds were dried in the sun for 2 days and then stored in poly bag.

5. Leucaena leucocephala

Fruits of Leucaena leucocephala were collected from Pabel Nagar colony. The fruits were collected from the ground. Seeds were extracted from flat and thin capsules and then stored in poly bag.



SEEDS OF Citrus limon

RESULT

Citrus limon

CLASSIFICATION:

- Kingdom - Plantae
- Division - Angiospermae
- Class - Dicotyledon
- Family - Rutaceae
- Genus - Citrus
- Species - C. limon

HABIT:

Also known as lemon, is a small tree or spreading bush, 3-6m high, branches have small sharp thorns at the axils of the leaves. Leaves are green shiny and elliptical, long, finely toothed with slender wings on the petiole. The flowers are white on inside with a violet streaked interior. The fruit size and shape are highly variable from spherical to oblong and is green to bright yellow in colour.

SEED MORPHOLOGY

Seeds nestle within the pulp near the centre of each lemon. seeds are 8 to 10 in number. They are hard, wrinkled, small, ovoid and polished, white in colour. seeds are ~~mono~~ dicotyledonous.

SEED DISPERSAL

- > Lemon seeds mainly show zoochory i.e, the seeds are dispersed by animals.
- > The dispersion occurs when an animal (especially human beings), eat the fruit (lemon) and then drops the seed elsewhere.
- > Another way the seeds are dispersed is when the animal ingests seeds, then the seeds get excreted some distant off and thus process of dispersion occurs.
- > Wind can also cause lemon seeds to disperse.
- > There are times that a storm comes and it can blow a strong wind and send the fruits to a little bit of distance. Those lemons especially ripe fruits will start to decay and some of the seeds inside will germinate and eventually form a tree.

Some of the animals that may eat lemon fruits are mice, rats, squirrels and white cockatoos.

Hibiscus pedunculatus

CLASSIFICATION:

- Kingdom - Plantae
- Division - Angiospermae
- Class - Dicotyledon
- Family - Malvaceae
- Genus - Hibiscus
- Species - Hibiscus pedunculatus

HABIT:

It is a small, dainty, erect shrub that grows up to 1 to 2 m. The lower part of shrub is woody and sparsely branched. Slender stems and rough leaves are covered in short, star shaped hairs.

Leaves are mostly 3-lobed sometimes 5-lobed, and have toothed margins. Large, solitary, slightly drooping, pale to dark pink flowers are carried on long peduncles in the axils of the leaves. The fruit is a dry capsule which is 5 lobed.

SEED CHARACTERS:

The seeds are present inside the dry fruit capsule, seeds are so small and light in weight. They are surrounded by ^{white} cotton like fluff. seeds are brownish-black or black in colour, seeds are dicotyledonous.



SEEDS OF Hibiscus pedunculatus

SEED DISPERSAL

- The seeds mainly show Autochory i.e. the seeds are dispersed by explosion of fruit or self dispersal
- When the capsule matures, they dry and burst open to release seeds which falls to the ground and germinate to make more plants.
- The seeds also show Anemochory i.e. the seeds are dispersed by wind.
- When the capsule burst open to release seeds, some seeds that fall on the ground may also be blown away by the wind.



SEEDS OF Bixa orellana

Bixa orellana

CLASSIFICATION:

- Kingdom - Plantae
- Division - Angiospermae
- Class - Dicotyledon
- Family - Bixaceae
- Genus - Bixa
- Species - B. orellana

HABIT:

Also known as Sindoer, Achiote. It is a perennial, tall shrub that can reach upto 6-10 m. Bark is pale to dark brown in colour. The twigs are covered with rust coloured scales when young and bare when older. Leaves are glossy, ovate, ~~with reddish~~ they have round, heart-shaped base and a pointed tip. Flowers are pink, white or some combination. From the flower protrudes a striking ovoid shaped two valved fruit, covered with dense bristles. Fruits appear in variety of colour - maroon, brownish green and most commonly brightly red.

SEED CHARACTERS:

Seeds are present inside the ovoid fruit and are 10 to 60 in number. seeds are ovoid and angular 4-5mm long. Bright orange-red in colour. seeds are dicotyledonous. Orange-red pigment extracted from the seeds are

used in foods, drugs and cosmetics.

SEED DISPERSAL

- > Seeds show Autochory i.e dispersal by explosion or self dispersal.
- > When the pods mature, they dry, harden and split open, therefore exposing the seeds and some of the seeds fall on the ground.
- > seeds can also be dispersed by birds (zoochory).
- > Seeds colour attracts the birds and the birds disperse the seeds to other places.



SEEDS OF Moringa oleifera

Moringa oleifera

CLASSIFICATION:

Kingdom - Plantae
Division - Angiospermae
Class - Dicotyledon
Family - Moringaceae
Genus - Moringa
Species - M. oleifera

HABIT:

Also known as Moringa, Munga, drumstick.
It is a fast growing deciduous tree 10-12 m in height. Bark has a whitish grey color and is surrounded by thick cork. The tree has an open crown of drooping, fragile branches, and the leaves build up feathery foliage of bipinnate leaves. The plants bear scented clusters of bisexual flowers surrounded by five white-yellowish petals. The fruit is hanging, long, slender, triangular capsule. Fruit is green when young and turns brown at maturity.

The seeds are present inside the long, 3 sided capsule. seeds are globular with diameter around 1cm. seeds have 3 whitish papery wings. Fresh and raw seeds are quite tender, as they get dried and they become hard.

- They are greyish white in colour
- Each pod contains 10 to 30 seeds.

SEED DISPERSAL

- > The seeds show anemochory i.e seeds are dispersed by wind.
- > The seeds are light and winged
- > When the wind blows the seeds off of the tree, the papery white wings act like helicopter propellers, carrying the seeds away from the mother tree to be planted elsewhere.



SEEDS OF Leucaena leucocephala

Leucaena leucocephala

CLASSIFICATION :

- Kingdom - Plantae
- Division - Angiospermae
- Class - Dicotyledon
- Family - Fabaceae
- Genus - Leucaena
- Species - L. leucocephala

HABIT :

Also known as river samard, subabul or pit pit It is a fast growing, deciduous, thornless shrub or small tree reaching height of 3-15 m. Bark is smooth, pale grey, brown with numerous small raised spots (lenticels). The inflorescence is a cream coloured globular shape producing cluster of flat, brown pods 13 to 18mm long containing 15-30 seeds. Leaves are bipinnately compound with small grey-green leaflets, pungent when crushed. It is one of the highest quality & most palatable fodder trees.

SEED CHARACTERISTICS:

Seeds are present inside the flat pods, 15-30 in number seeds are hard, dark glossy brown, with a hard shining testa

seeds are elliptic oblong in shape

SEED DISPERSAL

- > The seeds show zoochory i.e, dispersal of seeds by animals (rodents and birds) and cattle.
- > when the pods get matured and dry they fall off the plant on the ground and the seeds get spread on the ground
- > Birds and rodents eat the seeds and then the seeds get excreted at some distance far from mother plant.
- > Or they might carry the seeds and drop them to another place, and dispersion occurs.
- > The seeds can also be disperse by wind (Anemochory).
- > when there is a strong blow of wind the light pods along with the seeds get ~~can~~ spread to far distances from mother plant where they germinate.

CHALLENGES FACED DURING THE WORK

Species which bear ripe seeds in adequate quantities at all times present little problem. Some species bear seed throughout the year but only a little at any one time and this makes seed collection slow.

Large indehiscent or fleshy fruits may be collected from the ground but even in these cases collection must be done quickly to avoid losses from animals, fungi or premature germination.

Some plants had thorns, so we had to wear gloves to collect the seeds.

The fruits of some trees were at high level so we had to take the help of long sticks.

Drying of seeds was another challenge because the seeds were either blown by the wind or were eaten by insects.

FUTURE PROSPECT

Seed dispersal is a vital, but complex, ecological process that involves many interacting agents and plays important roles in the maintenance of old-growth forest, as well as in the development of regenerating forest.

Seed dispersal can promote both forest restoration and primate conservation.

Seed dispersal is an important factor for biodiversity conservation. Insect species are playing a significant role in spreading the seeds and fruits of different plants.

Seed dispersal is expected to promote vigorous belowground development in seedlings and lower costs by reducing the need for nurseries, planting and seedling procedures.

For a plant, movement of the seed provides the single opportunity in its entire life cycle to change its geographic location. As the seed is deposited within the seedscape, this life history event sets the template for all future interactions in a plant's life.

Seed dispersal is of great conservation importance, since it is both affected by global change and affects the ability of plants to move or adapt to global change.

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