MODULE 29 - CASTOR BEAN

OBJECTIVES

By the end of the session the student will be able to:

1. Know about the Habit, Vegetative and reproductive parts of Castor bean plant.
2. Commercial value of Castor oil as purgative and in the preparation of polish, candles, transparent soap and illuminant.
3. Its recent use is in the preparation of biodiesel.
4. Due to its broad and densely packed leaves, it absorbs plenty of carbon-dioxide and reduces green house effects.

SUMMARY

Today, the growing need of humankind is fuel. The present day traditional fuels all come from plants which were fossilized over the years and got converted to fuel, be it coal, petroleum, kerosene, etc. These are called 'fossil fuels' and are rapidly deplenishing. Wood, too, has been traditionally used for fuel & massive deforestation has ensured that it too is scarcely available. Human beings have been looking out for alternative sources of fuel, to ensure a continuation of their existence.

Various plant species are being explored as sustainable sources of fuel. One such plant is the 'Castor Bean'. In this module we will explore various aspects of the Castor Bean – the botanical aspects of the plant, its various uses to humankind, including as an alternative fuel source, medicinal values, etc.

TRANSCRIPTION

Introduction

The earth is the habitat for vegetable - plants survive in soil, in water and to some extent in air also. Several bacteria and fugal spores survive in air. Their study is called "Airobiology". Various types of plants found on earth support animal life.

Ancient man was nomadic and a hunter. He moved from one place to another in search of food.
Gradually, he started agriculture and animal husbandry.

Though present day man is highly advanced and has achieved a lot because of science and technology, but even today he is the greatest sufferer among all the other animals as far as diseases are concerned.

In ancient days, when medical science had not been developed, man used plants as source of medicines.

Through trial and error, man understood the importance of plants in medicines. One of such plants is ‘castor bean’ or ‘castor’ plant.Leaves:

Leaves
The botanical name of castor bean is ‘Ricinus communis’. It is a member of the family Euphorbeaceae. It is an annual or biennial shrub. The leaves of castor bean are simple, alternate and parametafic. The petiole is long and has an exta floralnetary. It attracts insects for pollination. The venation is reticulate, multicostate and divergent.

Flowers
The inflorescence of castor is compound receme and the plant is monecius, bearing male flowers at the base and female flowers at the top of the same inflorescence.

The male flower has one bract and two bracteates. Perianth has five tepals, which are fused and valvalte. Basic number of stamens is five, which are branched like a tree, resulting in indefinite number. Ricinus male flower; bract; bracteoles 5; actinomorphic, male; perianth five, fused; androecium infinite.

The female flower is also bractate and bracteolate. Perianth has 5 tepals, fused and green in color. Gynoecium is tricarpelary; syncarpous; ovary superior; trilocular with axile placentation. Each chamber of ovary contains one seed.

The peculiar feature of ovary is that it is covered with spines, which stick to fur of animals and help in the dispersal of fruits. Styles 3, furcated, stigmas 6, feathery. Ricinus female flower bract, bracteoles 2, actinomorphic, female, perianth 5, fused, gynoecium 3, ovary superior.

Fruits:

The color of the fruit is green or red with several spiny outgrowths. The fruit is chizocarpic red madiheisal in three coccy. Each coccus contains one large seed. The outer sead coat of castor bean is smooth and mottled. There are two seed coats and mottled testa and membranous tegment. The seed contains thick, white endosperm, which is rich in oil. The microphyle of the seed is covered by the proliferation of the outer integument near microphyle. Due to caruncle, the seed of castor gives the false appearance of some worm. Birds pick up these seeds considering it as worms and take it to distant places. After realizing their mistake the birds throw it out, out of anger. This is how birds disperse the seeds. Thus, it is the caruncle, which helps in the dispersal of seeds of castor.

Uses
The seeds of castor are rich in oil. The oil content is up to 50% and it is extracted by hydraulic pressure. The oil is viscous & colorless or pale yellow in color. The oil is used to prepare polish and ointments. By passing hydrogen it forms wax, which is used to prepare candles and also applied to carbon paper. In villages the oil is used an illuminant. In railway department, the oil is used to illuminate signal lamps.Castor oil is used to prepare transparent soaps. It is also used to prepare linoleum, cosmetics, lipsticks, toothpastes, and

also used as hair oil. Atropine and cocaine medicines are also prepared by dissolving them in castor oil medium. In Ayurveda, castor oil is used as purgative. The oil cake left after the extracting of oil, contains three toxic elements. First, Ricin – highly toxic, causes clotting of blood. Second, Recinin – less toxic but narcotic. Third, Allergin – polysaccharide with proteins. These days moth of kosa silk is reared upon it to obtain silk. 'Aruna' variety is an improved variety with more oil content.

Bio-diesel

Biodiesel refers to any diesel-equivalent biofuel made from renewable biological materials such as vegetable oils or animal fats. Bio-diesel can be used in diesel engines either as a standalone or blended with petro diesel. Castor oil is the best substance for producing Biodiesel because it is the only one that is soluble in alcohol, and does not require heat and the consequent energy requirement of other vegetable oils in transforming them into fuel.

Each hectare of castor oil bean plants planted in arid and semi arid regions produces 350-650 kg of oil, which in turn produces 350-650 kg of Biodiesel per hectare. These production figures are without the use of any fertilizers and any form of irrigation.

Castor oil and its derivative castor Biodiesel is indispensable for preventing fuels and lubricants utilized in aircraft and space rockets from freezing at extremely low temperatures. Raw Castor Oils' major market is beginning to open in the energy field, with the growth of Biodiesel. Biodiesel, chemically known as an ester, is the result of the reaction between any oily acid and ethyl (ethanol) or methyl (methanol) alcohol.

Reduce Global Warming

An unintended but important advantage to a castor bean project is that the plants absorb carbon dioxide, thereby reducing greenhouse gas accumulations in the atmosphere. The estimated carbon dioxide absorption level of castor bean plants is 34.6 tonnes per hectare, with two growing cycles per year.

Cultivation

Castor bean is native of North America. Now it is cultivated in India, China, Brazil, Thailand, Russia, Sudan and Tanzania. In India, large scale cultivation is done in Andhra Pradesh, Gujrat and Karnataka. India occupies second rank in the world as far as the cultivation of castor bean is concerned. India exports castor oil and earns foreign exchange worth Rs. 550 crores.

Castor bean cultivation does not require much care. The crop gets ready within 5-6 months. Therefore, its cultivation in India should be encouraged.

GLOSSARY

1. Aerobiology : Study of organism present in air

2. Nectary : Nectar secreting gland

3. Monoecious : Bearing male & female flowers on same plant

4. Androecium : Male sex organ of a flower

5. Gynoecium : Female sex organ of a flower

6. Actinomorphic : Regular or symmetrical flower

7. Endosperm : Storage part of a seed

8. Testa : Outer seed coat

9. Tegmen : Inner seed coat

10. Mottled : Blotchy

11. Caruncle : Hard outgrowth on microphyle of seeds, to attract birds

12. Linoleum : Canvas coated with oil, used as flooring

13. Toxin : Poisonous chemical secreted by plants and animals

14. Purgative : Strongly Laxative

FAQs

Q.1. What is the botanical name of Castor Bean?
Ans: - Ricinus communis.

Q.2. Which family does the Castor bean belong to?
Ans: - Eupharbiaceae

Q.3. What is the habit of Castor bean?
Ans: - Shrub, because it shows branching from the base.

Q.4. What is the peculiar feature of the leaves of Castor plant?
Ans: The stalk of the leaf or petiole has a nectary. This is called extra floral nectary.

Q.5. Why Castor plants are called monoecious?
Ans: Because it has male & female flowers separate but on the same plant. Male flowers at base & female at the top of same inflorescence. Actually Castor bean is one of the plants on the basis of which Camerarius discovered sex in plants.

Q.6. What is the peculiar feature of stamens of Castor bean?
Ans: They are branched like a tree.

Q.7. What is the peculiar feature of the ovary of Castor bean?
Ans: It has spiny outgrowths due to which the fruit can stick to the fur of animals like goat & sheep, so that it can get dispersed.

Q.8 What type of fruit is found in Castor bean?
Ans: Dry, schizo carpic, regma which dehisces in 3 parts, but these parts remain attached to each other for some time.

Q.9. How many seeds are found inside single fruit of Castor?
Ans: Three

Q.10. What is the peculiar feature of the seeds of Castor?
Ans: They are large in size, with shining & mottled seed coat & hard with caruncle at micorpylar end.

Q.11. What is morphology of caruncle?
Ans: It is proliferation of outer integument.

Q.12. What is the function of caruncle?
Ans: - It helps in the dispersal of seeds by birds.

Q.13. Is seed of Castor endospermic or non endospermic?
Ans: Endospermic. The endosperm is oily.

Q.14. What is the percentage of oil in Castor seed?
Ans: 50%

Q.15. What are uses of Castor oil?
Ans: (i) Lubrication of Machines
(ii) Engine oil for trucks.
(iii) Manufacture of wax.
(iv) Illumination.
(v) Soap manufacture.
(vi) Linoleum manufacture.
(vii) Hair oil.
(viii) Preparation of carbon paper.
(ix) Preparation of cosmetics.
(x) Preparation of lipsticks.

Q.16. Name two common medicines in which Castor oil forms the base?
Ans: Atropine & Cocaine

Q.17 What is the use of Castor oil in Auyurveda?

Ans: Purgative.

Q.18. Why oil cake of Castor bean cannot be used as fodder?
Ans It contain Toxic compounds
(i)Ricin (ii) Ricinin (iii) Allergin

Q.19. What in the use of Castor plant in sericulture?
Ans: To rear kosa silk moth.

Q.20.Which improved variety of Castor has been raised by plant breeding?
Ans: Aruna Variety.

Q.21. What is native place of Castor bean?
Ans: North America

Q.22 In which countries of world Castor plant in cultivated?
Ans: India, China, Brazil, Thailand, Russia, Sudan & Tanzania.

Q.23 In which state of India Castor is cultivated?
Ans: Andhra Pradesh, Karnataka and Gujarat

Q.24 What is the rank of India as far as Castor cultivation in concerned?
Ans: Second

Q.25 What is earning of India in terms of foreign exchange from Castor oil?
Ans: Rs 550 Crores.