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Review Article

Economically important plants of tropical areas

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Abstract

The biological and logical meanings of plants, which are one of the important woody plants of our ecosystem, are reviewed in this article. Plants are mostly used for timber purposes, but in the present article the utility of plants with respect to their sowing, harvesting, in restoring, environmental use, and their educational and recreational value and bioesthetic planning is described.

Keywords bioesthetic, ecosystem, recreation, timber, utility

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Introduction

The Stone age passed into the bronze age and the latter into the iron age as man's agricultural needs demanded better tools. Modern man's life depends fundamentally on agriculture. The basic necessities of life- food, shelter and clothing are derived from the vegetable kingdom [1]. Plants are a source of fibers, fabrics, coloring matter, perfumes, beauty and other miscellaneous products. Fiber yielding plants are second only to food plants in their usefulness. Primitive tree dwellers and cavemen lived by hunting, foraging over fruits, seeds and roots that nature provides. Cereals are among the first plants to be domesticated [2]. The prominence of cereals as food plants is due to great adaptability, permitting their colonization on ecological habitat, ease of cultivation, tillering habit, compact and dry grains, and high nutritive value containing carbohydrates, fats, vitamins, and minerals. The legume seeds are source of food and provided proteins. The cultivation of plants was a great evolutionary accomplishment that relieved human from food gathering and hunting duties and enables them to devote time to invent, discover and develop other facets of life [3].

Botanical plants with economic value

Cotton: Gossypium L. (n=13), Ceylon cotton, Chinese cotton

Cotton, the world's most important non-food agricultural commodity was one of the first vegetable fibers used for textile purposes. The production of cotton is greater than that of all other fibers put together. India attained a high degree of perfection in the manufacture of cotton goods and considered as a chief center of the cotton industry. The main stem of the plant is monopodial and carries spirally arranged leaves; Leaves bear two kinds of buds- axillary and extraaxillary. Cotton develops dimorphic branching i.e vegetative and fruiting branches. Vegetative branches are morphologically similar to the main stem and don't bear flowers directly but give out secondary branches that are sympodial. The leaves are large palmately lobed and clothed with multicellular stellate hairs. Flowers are large and showy, surrounded by involucre of large leafy bracts [4]. The cotton fibers represent epidermal prolongations of seed coat cells. Cotton is a tropical crop, requires minimum frost frost-free growing season, and abundant sunshine.

The crop is susceptible to heavy rains but adequate soil moisture is required in the early stages of growth. Harvesting begins about six months after sowing and is the most expensive part in its farming. Cotton is picked as soon as the ball opens as shown in figure 1, if left in the field for a longer period it may fall out or get damaged by rain. Raw cotton is spun into yarn and woven into cloth and pass through a number of several processes such as ginning, baling, grading , marketing, opening, picking, carding, combing, and, drawing [5]. Hand separation of fibers was the only way to remove the fibers from the seeds Cotton contains cellulose that is, soft and supple that and makes it exceedingly valuable textile fiber. It is its superior over other fibers because of the combination of properties that make it suitable for a wide range of clothing.

Traditional uses

• Cotton contains cellulose which is soft and supple and makes it a valuable textile fiber.
• The outstanding quality of cotton is its high tensile strength.
• The cotton fiber has high dimensional stability i.e. resistance to a permanent change in length and therefore it is being used for industrial purposes
• Cotton resists repeated bending over a longer period of time
• Household articles including bed sheets, covers, pillow, towels, table clothes, blankets, tapestry fabric etc.
• In water repellant cotton, the individual fibers of cotton are rendered hydrophobic by treating with chemicals.
• The linter is used for stuffing cushions, pillows, mattresses, etc. It finds application in the manufacture of high-grade paper, cellophane, rayon, explosives.
• By suitable chemical treatments, it is used in manufacturing flame proofed cotton and resin-impregnated fabric.

Figure 1. Cotton plant with white open buds ready to harvest

Jute: Corchorus spp. (n=7), Family= Tiliaceae

Jute is the least expensive, but most important of all bast fibers and comes second in production only after cotton among all the natural fibers. The fiber is obtained from the stems of two cultivated species of Corchorus. It occupies an important place in the Indian economy, being the largest earner of foreign exchange. The first shipment of jute fiber from India to England was made in 1791. It was a monopoly crop of India which produced 99 percent of the world's production. However, after India's partition in 1947, India retained only the jute mills while most of the area producing superior quality of jute went to Pakistan

[6]. Today about 80 percent of the total world's production comes from India and Bangladesh. Bangladesh is by far the largest exporter of raw jute while India leads in the export of manufactured jute products. Both the cultivated species are woody; little branched annual having simple, margined leaves with curved bristles as shown in figure 2. Flowers are solitary or arranged in flowered cymes. Small yellow flowers at maturity give rise to wrinkled capsules, flattened at the top, and enclose brown seeds. Fibers are whitish. In India, 75% of the jute crop is *C. capsularis*. It is mainly rainy crop, thriving best in warm, humid, and rich loamy, alluvial soil where rainfall ranges from 150-250 cm. The fertile alluvial soils of river delta of Ganges, Brahmaputra are suited for jute cultivation. Seeds are sown broadcast. In large fields, seeds are sown close together to produce unbranched stalks. The plant matures within three to five months. Plants are harvested when 50 percent of them are fruiting. At this stage both the yield and quality are good. Early harvesting gives poor return and fiber lack strength [7]. Late harvesting increases the yield and produces coarse fibers. A trained cutter cuts as many as six to eight plants at one time. The cut stems are tied in bundles and left in fields during which leaf wilts. Jute fiber contains 63 percent cellulose, low content compared to hemp (77), flax (82), or cotton (86). They have a high proportion of lignin which makes them less durable. Jute is the world's most important bagging textile. It has wide applications in the manufacturing of rugs, blankets, carpets, rope, twine, curtains, coarse cloth.

Traditional uses

• Jute finds wide application in the manufacture of rugs, blankets, carpets, cloth backing, carpets, oil and cloth
• They have a high proportion of lignin which makes them less durable
• Jute butts are used for the manufacture of paper and paperboard
• It is the least expensive of all the fibers and second only in production after cotton among all natural fibers and therefore important place in economy being largest earner of foreign exchange.

Figure 2. A jute vegetative plant

Coconut: Cocos nucifera, (n=16), Family= Arecaceae

It is native of the Pacific coast of tropical America, carried westward by oceanic currents to Asia. The place of origin of coconut is in the Indo- Pacific region from where it is scattered throughout the coastal regions of the world by sea currents. The plant is grown in coastal and deltaic regions of tropical and subtropical countries. The united states of America are the biggest importer of coconut. Coconut production is mainly confined to coastal regions of Kerala, Tamilnadu, Karnataka, and Andhra Pradesh. Coconut palm

is tall, a tree attaining a height of 15-30 m and characteristic in having an inclined trunk, the main trunk is unbranched with thick swollen base surrounded by a mass of adventitious roots. The inflorescence is produced in the axil of the leaf and consists of a central axis with up to 40 lateral branches [8]. Flowering begins when the trees are four to five years old. The most remarkable feature of the coconut palm is that it keeps on flowering all year round and fruit takes about 12 months to ripen as shown in figure 3. The number of fruits that reach maturity is between three and seven percent inflorescence. The mature fruit is a fibrous drupe, ovoid differentiated into exocarp which is tough smooth and hard. At maturity, it is shredded off middle thick fibrous mesocarp constituting the coir of commerce. The endocarp encloses within it a single hollow seed with brown testa. The cavity of nut is partially filled with liquid coconut milk containing liquid endosperm. Coconuts are propagated by seeds. Germination is slow and takes four months for the shoot to emerge. The cotyledon begins to swell and extend into the cavity of endosperm where it enlarges into an organ known as the apple. It absorbs nutrients from coconut water and forms solid endosperm. Nutrients are absorbed by the root from fibrous mesocarp [9].

For successful cultivation, palm requires plenty of sunlight, an average temperature between 27-32 C and well-distributed rainfall. It can be grown on a wide variety of soils, coastal sands, alluvial, volcanic, clay soil provided they have good drainage and adequate aeration. Porous soil behind beaches is best suited for the growth of coconut. The main fatty acid constituents of coconut oil is lauric 44-51%, myristic 13.1-18.1, palmitic 7.5 -10.5%, caproic 0.2-0.5%, arachidonic, oleic, linoleic acid [10]. Coconut oil is white to yellow solid fat at a temperature below 24 degrees Celsius. At high temperature, it melts to give a colourless pale brownish-yellow oil.

Traditional uses

• Coconut palm has attained a unique position among the tropical plants providing all necessities of life due to which it is known as the tree of heaven or Kalpavriksha

• Coconut oil is classed as edible industrial oil. Due to the higher content of lauric and myristic acids, oil has high saponification value, and soap obtained lathers freely in hard and saltwater. It is used in the manufacture of lubricants, detergents, cosmetics. The oil is used for anointing the body and for illumination

Figure 3. A coconut plant showing profuse flowering inside spathe

• Ripe coconut is used in religious offerings; the fibrous mesocarp provides coir of commerce

• Whole shells are used for domestic utensils such as drinking vessels

• They are employed for making buttons, combs, bangles, and musical instruments. Finely powdered shells are used as the filler in plastics.
• It finds wide applications in the manufacture of lubricants, cosmetics such as face creams, shampoos, rubber, brake fluids for airplanes.

Wheat: Triticum spp L. (n=13), Family= Poaceae

All kinds of wheat belong to genus *Triticum* of the tribe *Triticeae* in the subfamily Pooideae. Of all the kinds of wheat, bread wheat, *T. aestivum* L. is the most widely grown food crop. It is the staple food of at least one-third of the world's population where China is the leading producer followed by US. In India, common bread wheat is the most important containing 86% of the total acreage. The wheat stem is erect and cylindrical, nodes are solid, internodes are hollow. The wheat inflorescence is a terminal distichous spike i.e. with spikelets borne singly at the nodes on alternate sides of zig-zag rachis as shown in figure 4 [11]. Each spikelet consists of two to five florets attached alternately on opposite sides of a short central axis called Rachilla. The wheat grain is a dry, one-seeded, indehiscent fruit known as Caryopsis, grain is hard or soft in texture. The endosperm makes up to 82% of the grain by weight. The delimiting layer i.e. Aleurone layer is rich in nutrients, niacin, vitamins, minerals, and high protein content. Wheat is winter or rabi crop, only in the hills of South India and North India and is a widely cultivated plant. It is sown in September and October after summer monsoon rains are over.

Figure 4. A wheat plant at flowering stage

The water conserved during heavy monsoons is beneficial for wheat cultivation in the rabi season [12]. The duration of wheat crop and time of sowing and harvesting vary greatly in India. Wheat responds well to the application of commercial fertilizer i.e. NPK. Wheat is a close sown crop and good competitor of weeds. Once established, it tends to outgrow weeds and does not need much care. The crop is harvested when it is ripe and straw has turned golden yellow and is harvested using sickle. The wheat is threshed out employing sledge and during threshing, straw is broken into pieces, and grain is squeezed out of the ear. In many advanced countries, gigantic combines cut and thresh the crop in the field. The thoroughly cleaned wheat grains (free from chaff, sticks, straw, weed seed, and other materials are moistened to toughen the bran. Wheat contributes substantially to the world's food supply and constitutes an important source of carbohydrate. Wheat is being consumed all over in the world in various forms. Industrial uses of wheat include the manufacture of starch, gluten, distilled spirits, malt, and pasta, etc. Wheat starch is preferred by

many laundries for use in finishing clothes. Gluten is used for the production of monosodium glutamate a product that intensifies the flavor of food. Wheat bran is rich in proteins, vitamins, valued livestock feed. It is employed not only for nutritional qualities but also for its role as roughage which stimulates intestinal peristalsis.

Traditional uses

• In technically advanced countries, wheat is consumed in the form of leavened bread but in a wheat-growing region nearly 85-90 percent is used in the form of chappatis, in form of nan, parantha, and poori
• Industrial uses of wheat include the manufacture of starch, gluten, malt, pasta, etc.
• Wheat bran is rich in proteins, vitamins and is valued livestock feed
• Gluten is used for the production of monosodium glutamate, a product that intensifies the flavor of food
• Wheat straw is used for making corrugated paper, high quality insulated building board.

Rice Oryza sativa L. (n=12), Family : Poaceae

The genus *Oryza* belongs to the tribe Oryzeae of subfamily Pooideae. They are distributed in tropical and subtropical regions of Africa, Asia, Australia, and South America. Of the two cultivated species, *O. sativa* L. is extensively cultivated in warmer regions of the world. The rice plant is a semiaquatic, annual grass with cylindrical jointed stem but may go up to 5m in floating rices. Rice has a shallow root system, its extent is controlled by the nature of the soil and water supply. The leaves are borne alternately on the stem in two ranks one at each node, each consisting of the leaf sheath, leaf blade, ligule, and auricles, the former encircling the whole or part of the internode. The rice inflorescence is a loose terminal panicle. The spikelets are borne singly but clustered forms with two to seven spikelets together are known as shown in figure 5 [13].

Figure 5. A rice plant with inflorescence

The flower is self-pollinated and is surrounded by lemma and palea. The mature rice grain is a caryopsis. Rice is invested in the hull is called rough rice. Rough rice consists of a 20 percent hull, grain coat is differentiated into epicarp, mesocarp, cross cells, tube cells, integument. The endosperm consists of a single aleurone layer of polygonal cells with a central mass of thin-walled parenchymatous tissue. The rice crop is grown over a wide range of climatic conditions, requires high temperature, abundant source of water, impervious soil to prevent loss of water by seepage, provision for steady surface drainage to allow the land to dry out sufficiently for harvesting. The rice crop thrives best under conditions of high

temperature and humidity, the average temperature lies between 21 and 35 degrees Celsius. Rice responds well to nitrogenous and phosphate fertilizers. Crop sown under dry conditions need regular weeding and add much to the cost of cultivation [14]. The right time for harvesting paddy is when panicles are turned yellow and lower kernel are in the hard dough stage, harvesting is done mostly by hand sickles or by large self-propelled or tractor drew combines that cut thresh and bag the grains all in one operation. Rice is the most important of the world's cereals and forms basis of the diet of millions of people in southeast Asia.

Traditional uses

• 90 percent of rice is eaten in the form of cooked preparations with cooked pulses, curd, vegetables, fish and meat
• In south India, fermented preparations such as dosa, idli, and upma are prepared from a mixture of rice and black gram
• Rice flour is used in confectionery, ice creams, puddings and pastry
• Alcoholic drinks such as sake in Japan and wang tsin in china are made of rice through fermentation
• In china and japan, a very fine type of paper is manufactured from rice straw which is employed for thatching, making hats, sacks, ropes, and baskets.

Conclusion

There are many economically viable plants available in tropical areas which are a source of nutrition and are commercially exploited to sustain the economy of our country. Their timing of sowing, harvesting plays a great role in their utility as a fiber, soaps, perfumes, medicine, fruit, and other necessities and source of luxury in daily life. lants provide food directly, of course, and also feed livestock that is then consumed itself. Besides, plants provide the raw materials for many types of pharmaceuticals, as well as tobacco, coffee, alcohol, and other drugs. The fiber industry depends heavily on the products of cotton, and the lumber products industry relies on wood from a wide variety of trees (wood fuel is used primarily in rural areas).

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