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Research Article

IMPORTANCE OF DATE PALM CULTIVATION IN INDIA

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A B S T R A C T

Dates are the fruit of a desert palm tree. It is one of the few crops that grow in the desert. Date palms have been described as the "tree of life." The trees grow very large; produce fruit for a long time; and can survive long droughts and extremely high temperatures. According to an old Egyptian saying "A date palm is the only creation of God that resembles man. Unlike other trees, a date palm gives more as it grows older." Education is the most important tool to bring changes in human behavior and thus to implement the recommended agronomic practices of crops that are important for the improvement of production and productivity. The agronomic practices of date palm production such as propagation and irrigation methods and plant spacing employed by farmers are traditional and inappropriate for the production of date palm which is inherited from generation. The farmers use local varieties that are low yielders as well as low in quality. Moreover, they are using postharvest handling practices that are not suitable for the production of high quality date fruits. Furthermore, date palm production is constrained with lack of improved varieties, high incidence of diseases, and insect pests. Continuous training, and extension services, research, and developmental interventions in the cultivation and management of date palm trees as well as handling of date fruits by the responsible stakeholders are recommended to improve the incomes and livelihoods of the farmers. The climatic features existing in the Indian arid zone are compatible with the requirements of successful date palm plant production. Planners, researchers and modern farmers are making serious efforts at converting this vast mass of arid land into profitable green land, thereby changing the economic status of the region. Planting date palm in Western Rajasthan can help check desertification and can strengthen rural economies by generation of employment besides providing net monetary income to farmers. Considering the various agriculture advances and recent technological innovations in various fields aimed at regenerating and revitalizing the arid zone biosphere, it is not hard to visualize, Great Indian Thar Desert full of lush green forest, orchards and crop plants.

INTRODUCTION

The date palm (*Phoenix dactylifera*) tree is considered as a symbol of life in the desert, as it tolerates high temperatures, water stress, and salinity more than many other fruit crops. It is one of the most valuable domesticated fruit trees because of its significance in human societies, health benefits, productive capacity in harsh semiarid and arid environments, and the range of subsistence products from its fruits and other parts of the large palm. The crop has been cultivated since ancient times. The date palm is considered a renewable natural resource because it can be replaced in a relatively short period of time or used through conservation efforts without depletion. Since the inception of mankind, human beings have been using date palm. The synonyms of P. sylvestris are Date-sugar palm, Indian wild date, Indian wine palm, Silver date palm, Sugar date palm, and Sugar palm. This palm produces edible fruits but it is generally called Wild date palm to distinguish it from the closely related *Phoenix dactylifera,* which is known as Date palm and is cultivated agriculturally as the commercial source of edible dates. Date palm fruits are eaten as raw dates (fresh fruits), dry dates (Chuhhara) and soft dates (Pind Khajoor). Dates are highly nutritious and delicious. The fruit plays an important role in the daily nutrition of human populations in regions where date palms are grown. Its additional use as a livestock feed supplement gives the tree much added value. It is an important multi-purpose tree and a significant earner of revenue for both small and large farmers. The date palm also makes a significant contribution towards the creation of equable micro-climates within oasis ecosystems, thus enabling agricultural development to be sustained in many drought- and saline-affected regions. All

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secondary products of the palm result from annual pruning and have essential uses for the cultivator.

History

Fossil records show that the date palm has existed for at least 50 million years. Dates have been a staple food of the Middle East and the Indus Valley for thousands of years. There is archaeological evidence of date cultivation in eastern Arabia between 5530 and 5320 BC. They are believed to have originated around what is now Iraq, and have been cultivated since ancient times from Mesopotamia to prehistoric Egypt. The Ancient Egyptians used the fruits to make date wine, and ate them at harvest. There is archeological evidence of date cultivation in Mehrgarh around 7000 BCE, a Neolithic civilization in what is now western Pakistan. Evidence of cultivation is continually found throughout later civilizations in the Indus Valley, including the Harappan period 2600 to 1900 BCE. In Ancient Rome the palm fronds used in triumphal processions to symbolize victory were most likely those of Phoenix dactylifera. The date palm was a popular garden plant in Roman peristyle gardens, though it would not bear fruit in the more temperate climate of Italy. In later times, traders spread dates around South West Asia, northern Africa, and Spain. Dates were introduced into Mexico and California by the Spaniards in 1765, around Mission San Ignacio.

Distribution: *P. sylvestris*, together with 13 other species, forms the genus Phoenix. All these species share similar morphological, anatomical and genetic characteristic with Date palm (*P. dactylifera). P. sylvestris* grows naturally and is cultivated around homesteads, farmland periphery and in marginal lands along the roadside and canals, even on fallow land. It can survive in disturbed areas, such as wastelands or seasonally inundated areas. *P. sylvestris* is widely distributed in India, Pakistan, Myanmar, Nepal, Bhutan, Bangladesh, Mauritius, China and Sri Lanka. In India, it is most commonly found in Rajasthan, Gujarat, Himachal Pradesh and Haryana states.

Table 1 Botanical position of date palm

Botanical position of Phoenix dactylifera		**Botanical position of Phoenix sylvestris**	
Kingdom	Plantae	Kingdom	Plantae
Clade	Angiosperms	Sub kingdom	Tracheobionta
Clade	Monocots	Super division	Spermatophyta
Clade	Commelinids	Division	Magnoliophyta
Order	Arecales	Class	Liliopsida
Family	Arecaceae	Subclass	Arecidae
Genus	*Phoenix*	Order	Arecales
Species	*dactylifera*	Family	Arecaceae
		Genus	*Phoenix*
		Species	*Phoenix sylvestris*

Synonyms of *Phoenix dactylifera* are-(1) *Palma dactylifera* (2) *Phoenix chevalieri* (3) *Phoenix iberica*

Picture of Phoenix dactylifera

Picture of Phoenix sylvestris

Botanical description: *P. sylvestris* shares several characteristics with *P. dactylifera* (Date palm). Date palm may reach an age of over 100 years.

Table 2 Botanical description of date palm tree

Sl.	**Various parts of tree**	**Characteristics**
1	Height	9-50m
2	Trunk	Solitary, robust
3	Leaves length	3-4.5m
4	Colour of leaves	Greenish brown with thorns on the base
5	Leaflets	30-45 cm long, 2.5-5 cm wide
6	Leaf sheath	Reddish brown, fibrous, pseudo-petiole, 40-50cm long and 3-5cm wide
7	Acanthophylls	Yellow-green, very sharp, conduplicate and arranged
8	Staminate flowers	White-yellow, musty-scented
9	Calyx	Deep cupule with three poorly defined lobes-2-2.5 mm long.
10	Petals	3-4, obtuse apices, slightly hooded
11	Anthersare	3-4mm long
12	Pistillate inflorescences	Erect, changed arch –shaped on fruit maturation.
13	Peduncle	Green, upright, becoming golden-orange with arching on fruit maturation
14	Fruit	Obovoid in shape, 15-25mm long, 12mm broad, contain a moderately fleshy and astringent mesocarp.
15	Seed	15-20 mm long, 7-10 mm wide, obovoid and rounded apices, monocotyledonous, dioecious
16	Roots	Secondary roots with smaller lateral roots.

Uses of date Palm

1. Dates have a staple food of the Middle East and the Indus Valley for thousands of years.
2. Ancient Egyptians used the date fruits to make date wine.
3. In ancient Rome the palm fronds used in triumphal processions to symbolize victory.
4. The date palm was a popular garden plant in Roman peristyle gardens.
5. Dry or soft dates are eaten out of hand.
6. It may be pitted and stuffed with fillings such as almonds, walnuts, pecans, candied orange and lemon peel, tahini, marzipan or cream cheese.
7. Partially dried pitted dates may be glazed with glucose syrup for use as a snack food.
8. Dates can also be chopped and used in a range of sweet and savory dishes.
9. Date nut bread, a type of cake is very popular in USA.
10. Vinegar made from dates is a traditional product of the Middle East.
11. Recent innovations include chocolate covered dates and products such as sparking date juice.
12. Muslims break fast in the evening meal of Ramadan, it is traditional to eat a date first.
13. Dates are one of the ingredients of HP sauce, a popular British condiment.
14. Dates can also be dehydrated, ground and mixed with grain to form a nutritious stockfeed.
15. In Israel, date syrup is used as a honey substitute while cooking chicken and also for sweet and desserts.
16. 16.In Pakistan, a viscous, thick syrup made from the ripe fruits is used as a coating for leather bags and Pipes to prevent leaking.
17. Date seeds are soaked and ground up for animal feed.
18. Date oil is suitable for use in soap and cosmetics.
19. A source of oxalic acid.
20. Date seeds are also ground and used in the manner of coffee beans, or as an additive to coffee.
21. Stripped fruit clusters are used as brooms.
22. Recently the floral stalks have been found to be of ornamental value in households.
23. Date palm leaves are used for Palm Sunday in the Christian religion.
24. In North Africa, they are commonly used for making huts.
25. Mature leaves are also made into mats, screens, baskets and fans.
26. Processed leaves can be used for insulating board.
27. Dried leaf petioles are a source of cellulose pulp, used for walking sticks, brooms, fishing floats and Fuel.
28. Leaf sheaths are prized for their scent and fibre from them is also used for rope, coarse cloth and large Hats.
29. Young date leaves are cooked and eaten as a vegetable, as is the terminal bud or heart, though its removal kills the palm.
30. The finely ground seeds are mixed with flour to make bread in times of scarcity.
31. The flowers of the date palm are also edible.
32. The flower buds are used in salad or ground with dried fish to make a condiment for bread.
33. Dates and yogurt or milk are traditionally the first foods consumed for Iftar after the Sun has set during Ramadan.
34. Date palm fruits are recommended to pregnant women.
35. Date palm materials are used to make houses, boats, baskets, furniture and other things.
36. The palm heart (apex of the tree) is often very tasty and animals like to eat it.
37. Date palm tree produces a sweet sap that is made into candy, sugar and wine.
38. Palm tree trunks are used in making bridges that cross canals.
39. Palm tree trucks are used to make grids and fences.
40. Elastic fibers that cover the trunks are used to make camel and horse saddles.
41. Parts of the leafstalk are used as trowels by mason and as beaters by washerwomen.
42. Mats, plates and baskets are made with stalks.
43. Among the other things made with palms are dye, paper, surfboards and wax.
44. Date fruits are used as a laxative and a treatment for weak stomachs.
45. Good dates are eaten locally or packaged in factories and often shipped aboard.
46. The poor date fruit ones are fed to cattle.
47. In the Middle East, even factories that produce date flakes as a breakfast food.
48. Date palms have been the traditional staple of the Bedouin diet. Bedouin could go for months, subsisting on nothing but dates and water.
49. Date palm provides valuable shed.
50. Date palm fruits are also used for making different products such as chutney, pickles, jam, juice and other bakery items.
51. In Christianity, the palm leaves are used for celebration of Easter Sunday.
52. Date palm wood is used to construct beehives, fishing boats and traditional dwellings.
53. The date palm yields a variety of products for use in agricultural production and for domestic utensils.
54. All non-fruit components of the date palm (frond bases, midrib, leaflets, spikelets, fruit stalks, spathes) have a certain but limited value for ruminant feeding.
55. Leaves are very often used to construct fences providing wind protection and creating favourable micro-climates for horticulture and/or in nurseries.
56. Secondary products of the palm result from annual pruning and have essential uses for the community.
57. Generally the juice of *P. sylvestris* is consumed as a cooling beverage.
58. The trunk is used for changing the path of water into the turbines of water mills.
59. The leaves are frequently used for preparing floor mats, brooms and hand fans among other things.
60. The plant juice (neera) is collected by the peoples for preparing jaggery and toddy.
61. Worldwide, wild date palm flowers are extensively used in the preparation of sugar and alcohol.
62. The sweet fruits of the plant are used in making jelly.
63. The sap from *P. sylvestris* is extensively used for preparing sugar and traditional sweet Bengali cuisine.

Health Benefits of Date Palm

1. Relieve constipation.
2. Reduce heart diseases.
3. Control diarrhea.
4. Help in pregnancy.
5. Date palm has provided many pharmaceutical uses from the ancient times till now.
6. Medically, dates were recommended in mouth washes.
7. As a purgative or in gynaecologically related interventions.
8. Dates forms part of various ointments, bandages and opthalmic prescription.
9. Dates are applied with quinces, wax and saffron to the stomach, bladder, belly and intestines.
10. The sap of leaves is a remedy for nervousness, kidney trouble and putrid wounds and calms the effervescence of the blood.
11. Burnt seeds are made in an ointment for ulcers or a collyrium that produce long eyelashes.
12. The fruit, because of its tannin content, is used medicinally as a detersive and astringent in intestinal troubles.
13. In the form of an infusion, decoction, syrup or paste, is administered as a treatment for sore throat, colds, bronchial catarrh.
14. It is taken to relieve fever, cystisis, gonorrhea, edema, liver and abdominal troubles.
15. It is said to counteract alcohol intoxication.
16. The seed powder is an ingredient in a paste given to relieve ague.
17. A gum that exudes from the wounded trunk is employed in India for treating diarrhea and genito-urinary ailments.
18. It is diuretic and demulcent.
19. The roots are used against toothache.
20. In Indonesia and India date sugars are considered more nutritious than cane sugar.
21. Fresh sap of *P. sylvestris* is highly rich in vitamin-C .
22. The sap is used as micronutrients and acts as a source of iron and vitamins.
23. The fruit serves as a tonic and restorative, and is also used as an analgesic to mitigate pain from backache and in the buttocks.
24. It is widely used as an aphrodisiac, sweetener and diuretic and in the treatment of vomiting, vertigo and unconsciousness.
25. Dates contain a good amount of dietary fiber and facilitate evacuation of the bowels.
26. Dried dates improve cardiovascular health by soaking out all the cholesterol from the arteries.
27. Dried dates have high calcium content and improve bone health.
28. The leaf is useful in eye inflammation.
29. The central tender part of the plant cures gonorrhoea and gleet.
30. The gum of the plant is also found to be beneficial in genital –urinary disorders and diarrhea.
31. Date palm relieves asthma, emaciation and thrist.
32. Date palm increases taste, increases shukra.
33. Date palm is anti-pyretic.
34. Date palm fruit eating increases lactation, controls gonorrhea and tuberculosis.
35. Date palm's seed decoction controls dysentery.
36. Date palm fruit eating controls diabetes and enhances male fertility and body strength.
37. Herbal formulation of date palm-
    (a) Develop resistance against diseases
    (b) Dissolve kidney stone.
    (c) Relieve body pains.
    (d) Control irregular menstrual
    (e) Removes burning sensation
    (f) Plasters bone fractures
    (g) Cures dental caries.
    (h) Removes toothache
    (i) Cures helminthiasis
    (j) Cures gynecological disorders
38. Hemoglobin deficiency in male anaemic individuals can be well treated by the administration of wild date (*P. sylvestris*).
39. The ethanol extract of root of (*P. sylvestris*) has anti-ulcer activity.
40. Extracts of the fruit of (*P. sylvestris*) have anti-oxidant activity.
41. Root extract of (*P. sylvestris*) has antilithiasis activity.
42. (*P. sylvestris*) has the use in the treatment of urinary disorders and polyurea.
43. The plant exhibits many pharmacological activities having anti-oxidant, anthelmintic, antimicrobial, cytotoxic, erythropioetic, antidiarrhoeal, analgesic, diuretic, anti-ulcer, anti-hypertensive and anti-diabetic.properties.

Importance of Date Palm Cultivation

1. Date palm production can be an additional income source for farmers that help in reducing poverty in arid and semi-arid areas.
2. Date palm plays a significant role in the control of desertification and as means of land reclamation.
3. The date palm not only produces a concentrated energy food, it also creates a more amenable habitat for the people to live in by providing shade and protection from the desert wind.
4. Modern technological developments have made it possible to look at the palm as a raw material source for industrial purposes.
5. Dates have proved to be the best source to ensure food security during food shortages and crises.
6. The date palm is a crop capable of establishing a sustainable system in subsistence agricultural areas.
7. The tree is a spectacular palm for landscaping large areas.
8. It also prevents soil degradation.
9. In recent times, there has been a renewed interest in the date as a food source, not necessarily as a staple food, but rather as a component in food preparations like sweets, confectionary, baking products, institutional feeding and health foods.
10. The silver date palm is very popular among landscapers because of its low maintenance and beautiful appearance.
11. Date palm cultivation has great importance for the control of desertification in arid zones.

General Information

1. India is the largest importer of date fruits in the world.
2. Iran is the largest exporter in the world.

3. Date cultivated area of India 12493ha.
4. Date palm takes 4 to 8 years after planting before they bear fruit.
5. From a date palm tree maximum fruits are expected from 10th year onwards.
6. Dates have been a staple food of the Middle East and the Indus Valley for thousands of years.
7. The upper survival time limit of properly stored seeds remains unknown.
8. In India, Rajasthan, Gujarat, Tamil Nadu and Kerala are major date producing states.
9. Date palm tree is considered as a symbol of life in the desert.
10. Date palm is oldest tree cultivated on earth.
11. Date cultivation is mainly concentrated in Arabic countries, Israel and Africa.
12. Iran is one of major producers of date palm.
13. From last decades Indian Government take lot of effort and increased area under date palm cultivation.
14. The top five date-importing countries in 2004 were India, Pakistan, Yemen, Morocco, and UAE.
15. At present, India imports 60,000 t dry and soft dates every year.

Nutritional value

Table 3 Nutritional value of Deglet Noor dates (Nutritional value per 100 g)

Contents	Amount	Contents	Amount
Energy	282kcal	Folate (B9)	19 µg
Carbohydrate	75.03g	Vitamin C	0.4 mg
Sugars	63.35g	Vitamin E	0.05 mg
Dietary fiber	8g	Vitamin K	2.7 µg
Fat	0.39g	Minerals	Quantity %DV
Protein	2.45g	Calcium	39 mg
Vitamins	Quantity %DV	Iron	1.02 mg
Vitamin A equiv. beta-Carotene	6 µg	Magnesium	43 mg
lutein zeaxanthin	75 µg	Manganese	0.262 mg
Vitamin A	10 IU	Phosphorus	62 mg
Thiamine (B1)	0.052 mg	Potassium	656 mg
Riboflavin (B2)	0.066 mg	Sodium	2 mg
Niacin (B3)	1.274 mg	Zinc	0.29 mg
Pantothenic acid (B5)	0.589 mg	Other constituents	Quantity
Vitamin B6	0.165 mg	Water	20.53 g

Source: USDA Nutrient Database: IU = International units; µg = micrograms; mg = milligrams; DV=Daily Value

***Chemical composition*:** The palm heart of *P. sylvestris* is rich in carbohydrate and protein and has low amounts of minerals. Palm heart of *P. sylvestris* as a good nutritive supplement and can be used as a good alternative to cabbage or vegetables to alleviate hunger and malnutrition.

Table 4 The chemical composition of P. sylvestris sap

Sl.	Composition	Amount	Sl.	Composition	Amount
1	Carbohydrate	85.83%	7	Potassium	80mg/100g
2	Reducing sugar	3.95%	8	Calcium	4.76mg/100g
3	Crude protein	1.08%	9	Sodium	18.23mg/100g
4	Crude lipid	1.15%	10	Magnesium	2.23mg/100g
5	Crude fiber	0.18%	11	Vitamin B-3	12.3mg/100g
6	Ash	0.46%	12	Vitamin C	12.75mg/100g

Cultivation: Dates are an important traditional crop in Iraq, Iran, Arabia, North Africa and west to Morocco. Date palms can take 4 to 8 years after planting before they will bear fruit, and start producing viable yields for commercial harvest between 7 and 10 years. Mature date palms can produce 70–140 kg of dates per harvest season. Dates are the biggest oasis and desert cash crop. They are harvested from palm trees and dried out in the sun and stored for the winter time when they supply food for a family as well assist herds of camels, goats and sheep. *P. sylvestris* is is mainly found in drier-to-moist tropical and subtropical climatic zones. This tree occurs at an altitude of 1500 m. It cultivates better in the temperature range 20–40 °C. It requires a mean annual rainfall in the range 40–70 cm for growth, but it can survive with a minimal rainfall. Fully matured *P. sylvestris* are known as a drought adaptor. The date palm needs a climate with plentiful sun, minimal rain, yet good access to water, which to a large extent is only provided by oases. They are very cold tolerant, salt tolerant; they can also take extreme heat, dry and wet conditions. Maximum temperature is of around 50^0C, they can tolerate easily.

***Promising Cultivars*:** Date varieties have been developed over thousands of years of selection of seedlings, propagating only those possessing desirable characteristics through offshoots. An estimated 3,000 cultivars of date palm are available worldwide. The wild species of date palm, viz. *P. sylvestris,* which is found growing in almost all states of India, produces inferior quality fruit with little flesh. This palm is used for production of gur and a drink known as neera.

Table 5 The most important cultivars of date palm

Cultivars	Country to grow	Cultivars	Country to grow
Aabel	Libya	Khadrawi	Saudi Arabia
Ajwah	Saudi Arabia	Khalasah	Saudi Arabia
Al-Khunnaizi	Saudi Arabia	Khastawi	Iraq
Amir Hajj	Iraq	Khenaizi	United Arab Emirates (UAE)
Abid Rahim	Sudan, Nigeria	Lulu	United Arab Emirates (UAE)
Barakawi	Sudan	Maktoom	Saudi Arabia
Barhee	Saudi Arabia	Manakbir	Saudi Arabia
Bireir	Sudan	Medjool	Morocco, USA, Israel, Saudi Arabia, South Africa, Jordan, UAE.
Dabbas	UAE	Migraf	Yemen
Datca	Turkey	Mgmaget Ayuob	Libya
Deglet Noor	Libya, Algeria, United States, Tunisia	Mishriq	Sudan, Saudi Arabia
Dayri	Iraq	Mazafati	Iran
Fard	Oman	Nabtat-seyf	Saudi Arabia
Ftimi	Tunisia	Piarom	Iran
Halawi	Saudi Arabia	Rotab	Iraq
Haleema	Libya	Sag'ai	Saudi Arabia
Hayani	Egypt	Saidi	Libya
Iteema	Algeria	Sayer	Saudi Arabia
Kenta	Tunisia	Sukkary	Saudi Arabia
Umeljwary	Libya	Sellaj	Saudi Arabia
Umelkhashab	Saudi Arabia	Indi	*Sri Lanka*
Zahidi	Saudi Arabia	Tagyat	Libya
Zaghloul	Saudi Arabia	Tamej	Libya

Table 6 Promising date palm cultivars for the Indian arid zone

Cultivar	Colour of fruit	Yield/ Doka stage (kg)	Cultivar	Colour of fruit	Yield/ Doka stage (kg)
Halawy	Light orange with yellow	100	Sewi	Yellowish green	50
Shamran	Yellow with slightly pink	100	Kuneizi	Red	40
Barhee	Golden yellow	100	Zaagloul	Red	150
Khalas	Yellow	75	Zahidi	Yellow	125
Medjool	Yellow	75	Khadrawy	Greenish yellow	40

Propagation*:** Propagation of date palm is done with help of suckers as propagation with seeds is impractical. Select suckers or offshoots from mother plant. Suckers are obtained from 4 or 5th year after planting. Ideal weight of suckers should be of 15-20kg. At time of separation, remove older leaves and take single cut. The date palm is dioecious, having separate male and female plants. They can be easily grown ***from seed, but only 50% of seedlings will be female and hence fruit bearing, and dates from seedling plants are often smaller and of poorer quality. Most commercial plantations thus use cuttings of heavily cropping cultivars. Plants grown from cuttings will fruit 2–3 years earlier than seedling plants. Dates are naturally wind pollinated, but in both traditional oasis horticulture and in the modern commercial orchards they are entirely pollinated manually. Micro-propagation of plants through plant tissue culture techniques has already attained the dimensions of a full plant-based industry in several countries. Date palm trees have benefited greatly from the application of plant tissue culture techniques, since, for large-scale propagation, the offshoots growing at the base of the mother tree constitute the only source of explants used for the initiation stage. Because of the low success level at this initial stage, a large number of offshoots are often needed. In the Indian arid zone context, tissue culture techniques may be even more useful in solving relevant and intractable problems.

***Soil*:** It can be cultivated in any soil, don't have any specific requirement. But for good growth and yield, it required well drained, deep sandy loam soil. pH of soil should be in range of 7-8.

Land Preparation: - *Plough land thoroughly for two to three times and bring soil to fine tilth. After leveling of soil, dig pits of 1m x 1m x 1m size in summer month. Keep open these pits for two weeks and then fill it with well decomposed cowdung and fertile soil. Also add Chlorpyriphos@50ml in each pit.*

***Seed Rate*:** When row to row and plant to plant spacing of 6 meter is used, near about 112 seedling are accommodates in one acre. Whereas for 8m x 8m spacing 63 seedlings are accommodates per acre.

***Seed Treatment*:** To stimulate rooting, before transplantation in pit, dipped shoot base of suckers in IBA@1000ppm and Chlorpyrifos@5ml per Ltr of water for two to five minutes.

***Method of sowing*:** Transplant suckers in main field.

***Time of sowing*:** Sowing is done in February to March month and in August to September month.

***Sowing Depth*:**For transplantation, dig pits of 1m x 1m x 1m size.

Spacing: For transplantation, dig pits of 1m x 1m x 1m at distance of 6m or 8meter (square system).

***Weed control*:** Take weeding or hoeing operations depending upon intensity of weeds. Use mulch for weed control.

***Fertiliser*:** Well rotted farmyard manure (20–40 kg per tree) should be applied to date-bearing trees during the period September–December. Besides organics, each date-bearing tree should be given 0.5–1.0 kg nitrogen, 0.5–1.0 kg phosphorus and 0.25–0.5 kg potash per year. Ammonium sulphate (1–2 kg per palm) should be added along with manure. It is recommended to test for microelement deficiencies, and to spray the foliage when necessary with S, Cu, Fe, Mg, Mn.

***Irrigation*:** In summers, irrigation is given at the interval of 10-15 days and in winters irrigation is given at the interval of 30-40 days. The fully grown date palm is known as a drought-resistant fruit tree. However, continuous drought conditions will retard the growth of the plant.

***Intercropping*:** Intercrops such as cluster bean, cowpea, moong, moth bean, mustard and gram can be sown during summer and winter in rain-fed or irrigated fields. For first harvesting, 4 to 5 years are required. In between vegetables like gaur gum, rice, chilly, peas, brinjal etc. can be taken as intercrop.

***Flowering and Pollination*:** The dioecious nature of date palm means that male and female flowers are borne on separate trees. Spathe initiates in the axillary branch of crown leaves in February in arid zones. Female plants require artificial pollination for good fruit setting as pollination through natural means such as wind and insects is negligible. Pollination is a cumbersome and expensive practice requires climbing several times to the crown.

Fruit Thinning: Excess fruit load may cause shrivelling of berries, breaking of spathe stalks, more damage due to rain and humidity, and delayed ripening. It also reduces the size and quality of the fruit. It is therefore necessary to keep the optimum quantity of fruit and thin out the rest.

***Fruit Development*:** Fruit set takes place after fertilization. The fruit goes through four developmental stages, viz. Gandora or Kimiri (fruit is still hard and green); Doka or Khalal (fruits are fully grown but remain hard; their colour becomes yellow or red); Dang or Rutab (softening of fruits start from tips and finally the whole fruit is softened), and Pind or tamer (fruit is fully ripened; fruit weight decreases as a result of fruit dehydration). The fruits become edible from the Doka stage onwards.

***Pruning and Training*:** Being monocotyledonous, date palm trees have a single stem, therefore very little pruning and training is involved in the production of fruits. Trees are usually pruned once a year. Removal of one-third of the central strands after fruit set leads to better development of fruits and hastens ripening.

***Pest and their Control: Termites*:** These pests attack on the roots of the plants. To control termites, mix 800ml chlorpyrifos in 150 ltr of water and apply in the roots of the plants.

Lesser Date Moth: As a preventive measure, take two spray of Deltamethrin@2ml/Ltr of water with interval of 15 days. Take first spray at fruit bearing stage.

***Bird*:** When crop reaches in doka stage, fruits are damaged by bird. Cover bunch with thin wire net.

***White/red Scale**:* Remove scale infested branches or leaves and destroyed them away from field. If infestation is observed, take spray of Imidacloprid@60ml/100Ltr of water.

***Disease and their Control:-Graphiola leaf Spot*:** They are caused by fungus under humid conditions. Gray color spots are observed on both sides of leaves. To control this disease take foliar spray of Copper Oxychloride@3gm/Ltr of water.

***Alternaria leaf Blight**:* If infestation is observed, take spray of Mancozeb + Carbendazim@2gm/Ltr of water. Take second spray with interval of 15 days.

***Fruit Rot*:** Rainfall or high humidity at time of fruiting to maturity stage is main cause of fruit rot. Cover bunches with paper in early khalal stage. Remove few fruit strands from centre of bunch, it will provide ventilation and drying of wet fruits. If infestation is observed, take spray of Mancozeb + Carbendazim@2gm/Ltr of water.

***Harvesting*:** Bunches are harvested at full Doka stage for fresh date varieties edible at this stage. On average, 50 kg Doka fruits per year can be harvested from trees aged up to 15 years and thereafter 75 kg can be harvested per tree per year by using a recommended package of practices. Fruits are harvested at three stages, Khalal or doka stage (fresh fruits), soft or ripen stage (pind or tamar) and dry stage (chuhhara). Complete harvesting before start of monsoon season.

***Production*:** Worl dwide date production has increased tremendously from 1,809,091 t in 1962 to 6,924,975 t in 2005 (FAO 2006).

Table 7 Top ten date producers – 2016 (1000 metric tonnes, 1000 short tons)

Countries	Amount	Countries	Amount
Egypt	1,694	Iraq	615
Iran	1,066	Pakistan	495
Algeria	1,030	Sudan	439
Saudi Arabia	964	Oman	348
United Arab Emirates	672	Tunisia	241
World total	8,460		

Source:-UN Food and Agriculture Organization (FAO)

***Post Harvest and Storage*:** Fresh Doka (Khalal stage) fruit cannot be stored at room temperature for more than 4 days, whereas they can be stored up to 30 days under refrigeration and up to 50 days at freezing temperatures. Fresh dates are washed and packed in cardboard boxes. For the preparation of dry dates, full Doka fruits are washed and dipped in boiling water for 10 or 20 min, sulfiltated in 1,500 ppm potassium metabisulphite and dried either in an air-circulating oven at 48–52°C for 70–95 h or through sun drying for 80–120 h if the weather is dry.

***Potentiality of commercial cultivation of date palm in western Rajasthan*:** The vast geographical area in western Rajasthan state of Thar desert is climatically conducive for commercial cultivation of Phoenix dactylifera, commonly known as date palm. Availability of water for irrigation as well as thermal degree days in western Rajasthan are suitable for cultivation of this crop. The maximum available thermal degree days are 185-190 in the extreme western district, Jaisalmer. Over the period of the last two decades a maximum production of soft dates to the tune of 150 kg/tree could be harvested in the cultivar 'Khadrawi.

Problems in Date Palm Cultivation

1. The crop is neglected and grown for long period of time as wild plant without any agronomic and management practices.
2. Poor agronomic and management practices coupled with poor postharvest handling practices.
3. High incidence of diseases and insect pests is the bottleneck for the development of date palm production.
4. The knowledge and skills of farmers about insect pest management options are extremely low.
5. Pesticides that can be used for the management of pests are not available in the local market.
6. Lack of improved date palm varieties and their planting materials as well as use of inappropriate propagation methods were the other constraints of date palm production.
7. Propagation of date palm is carried out exclusively through use of seed which results in low quantity and quality of date palm fruits.
8. Poor postharvest handling practices such as poor storage, absence of curing, sorting, grading, and packaging, and lack of market linkage between producers and customers were also considered as problems of the sector.
9. Date palm fruits are collected from the ground after cutting the fruit bunches which incurs damage and thus decreases the shelf life and increases the postharvest loss of date fruits.
10. Absence of high-performing cultivars
11. Lack of technological know-how about date palm cultivation
12. Inadequate and inappropriate irrigation systems.
13. Socioeconomic constraints like lack of credit facilities and training sessions are the other problems for the development of commercial date palm production.

Causes of Degradation of Date Palm trees in Arab countries

The date palm *(Phoenix dactylifera*) is a major fruit crop in most Arab countries. it has historically been connected with sustaining human life and tradition of the people in the old world as a major agricultural crop. Arab countries possess 70% of the 120 million world's date palms and are responsible for 67% of the global date production. During the past 50 years, date palm groves were subjected to degradation due to extensive exploitation resulting from the increase in the human population and domestic animals. Like many other plants, some palms are in danger of dying out because of human activity. Date palm production faces serious problems such as low yields as well as marketing constraints. Over the last decade, productivity of date palm trees has declined in the traditional growing areas. As much as 30% of production can potentially be lost as a result of pests and disease. Technical and socio-economic factors contributed for date palm degradation. Also, date processing and marketing have affected the economic revenue from date production and its quality. Rehabilitation of date palm trees in the Arab countries is crucial and needs collaborative efforts and a dedicated budget.

***Date farming changed Vidarbha farmer's life*:** High temperatures like Vidarbha's is also a boon for date palm tree as higher the temperature, the sweeter the fruit becomes. A poor farmer's son has become one of the most successful farmers in the drought-prone Vidarbha region and wants others to follow his footsteps and end farmer suicides. Savi Thangavel, 68, can be seen attending to farmers from all over Vidarbha, foreign delegates, ministers and even bollywood actors on his farm, which is just 25 km from Nagpur in Mahegaon village. What is unusual about Thangavel's farm is that he doesn't grow usual crops, but you can see 130 organically grown date trees loaded with at least 25 kg to 30 kg of dates on each one of them. "One has to think out of the box. It is time that Vidarbha farmers come out of their usual methods of farming and stop growing the traditional crops, which is not earning them enough. There is huge potential in our Vidarbha land and the high temperature is a boon only if we grow right kind of crops," says Thangavel. Slowly, people knew him for the fresh vegetables in his farm. However,Thangavel was also not unaffected from the problems that a Vidarbha farmer faces. Everyday, he would see a farmer dying out of distress. He then started researching on the crops, which will remain unaffected by weather conditions and can also earn well in the market. Thangavel realised that date was one fruit which is grown in the deserts, and can survive in extreme temperatures and does not require very fertile soil and regular watering. As people started hearing about Thangavel's success, there were farmers coming to him from across the country to learn his techniques. Thangavel understood that there were many people who wanted to invest in date farming but did not have the knowledge or skill to do so. Thus he started The Thangavel date plantation organisation with a motto of 'Helping people to help themselves'. According to Thangavel, farming is the only field where there is endless opportunity to experiment and one can keep learning for life. The only way for farmers to come out of distress is to go out of the way to do unusual things

CONCLUSION

A country like India where population pressure is more (according to 2011 census, 121.1 crores), but production of foodgrains is less. That means there is huge gap in demand and production. Therefore, there is need to give more emphasis on agriculture to close the gap created. Whatever the outcomes, are coming from industrial sector and service sector that is not sufficient to feed the vast population as well as country's development. As a seventh largest country in the world, our country having vast agricultural land and if we able to bring efficiency in agriculture, food requirement of ever-growing population will be met as well as whatever the excess revenue from exporting agricultural products, that revenue and revenue from industrial sector and service sector will be used for country' development and that is only way to mould our country from developing to developed nation. Hence, agriculture is very important in our national economy and nation building. In that way we are slowly but steadily progressing, i.e. in world milk production, our country is first, in world sugar production our country is first, our country is first in spice production also etc. In 1950-51 food production was 50.10 million tons and in 2017-18 foodgrain production is 284.83 million tons. That means obviously progress is happening in agricultural sector. To boost agricultural production more and considering nutritional security of countrymen, crop diversification and farming diversification are the two needs of the hour. Out of agriculture still there are vast land unutilized as waste land or lack of irrigation facilities or nearly desert like land. In those lands, cultivation of date palm is a most suitable option to enhance agricultural production as well as bring more area under cultivation. Date palm is a drought resistant crop therefore the areas where irrigation facilities are absent; in those areas date palm is a natural crop. Date palm cultivation has great importance for the control of desertification in arid zones and forest recovery. Considering the importance of date palm cultivation in Indian context more extension work is needed to aware the people in general and farmers in particular.

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