D. G. Crawford
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THE DATE PALM IN INDIA.

THE FUTURE

OF

THE DATE PALM

IN INDIA.

(PHŒNIX DACTYLIFERA.)

BY

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PREFACE.

I HAVE been long convinced that of all the trees which have been tried in India, either for fuel or as a help in times of famine, the date trees offered the most advantage. I have had a good deal of experience in growing it, both from seed and from offsets, in the Lucknow Horticultural Garden. I have seen and tasted the fruit of some of the trees I had under my care. Others have also found that, when fertilized, and in certain seasons, the date trees in Oudh yield good fruit. I have now collected a great deal of information about the date tree and its fruit, both through Government and private sources, together with some data regarding rainfall in date districts and in districts of India which, from personal acquaintance, I think, especially suited to this useful tree. I thought, therefore, that putting the whole in the form of a small book might be of some public use. I have added some rules for the cultivation of the date palm in India, and a scheme for extensive date-planting in tracts where its presence in large numbers would be most desirable. In order to forestall any adverse criticism; I will admit that the objections to date-growing in India are two: (1) dampness of the atmosphere and soil during ripening time; (2) the depredations of wasps. Both objections I think may be easily disposed of. (1) As the main object of my scheme is—protection against failure of ordinary crops in times of *scarcity of rain* and famine, I think

one might safely, under such circumstances, let dampness *do its worst.* I am perfectly certain that, during such famine times, *there will be very little of it.* The peculiarity of this tree is *then* to come out in its full glory, after having, during previous years of abundant rain, stored itself with sap for times of scarcity. There are few other trees that can compete with the date palm in this speciality. With regard to years of abundant water, I would simply say—let, 'the fruit rot'; it won't be wanted, and won't be missed. When other crops are so abundant that they are almost unsaleable, it would be ridiculous to grieve after the date crop, which is rotting. I am perfectly certain, however, that the Indian peasant (especially if he have a number of boys), far from letting the dates rot, will soon discover that the date is nutritious and fit to eat, *long before the rotting time.* He that eats all his fruits, even when they would not rot, in their *unripe* state, may be depended on to consume his dates in their 'kharak' stage. He has, moreover, other alternatives. He can boil and dry his 'kharak,' and keep it for a more or less long time; he can feed his cattle on dates; or he can sell them for distilling into liquor, when they sweeten, and before they rot. (2) Wasps are certainly not a novel production of the insect world. They can be seen any day crowding the stalls of the sweatmeat sellers in every bazar. They don't attack only sweet dates, but sweet grapes, and all sweet fruits, not only in India, but in all parts of the world. Even in hot-houses in England, as soon as the ventilators are opened, wasps come in to eat any fruit that may be ripening. For this pest, a remedy might, without difficulty, be found in a well-

devised wasp-trap with something in it more attractive than ripe dates—such as sweetmeats, syrup, honey, treacle, &c., &c. Such a trap might be devised as would allow them to come in easily and make it almost impossible for them to escape again. A bottle, with its mouth so 'dodged' as to fulfill the above wants, might answer. Such a wasp-trap might be suspended from every female tree, about ripening time, or in the middle of a group of trees. Many varieties of wasp-traps are already in use in England and other places. The wasp is particularly fond of poking about holes, and I think a hole with something sweet inside would be especially suited to its propensities. The destruction of wasp-nests would also help to diminish their numbers. There will, however, be plenty of time between the sowing and planting of date trees and their fruiting, during which any number of wasp-traps may be devised. I think I have met the two objections which might be brought forward against my scheme. I know of no other, excepting perhaps a financial one. Any expenditure, however, on such a scheme, which at the outside would only be required for 10 or 15 years, would, in my opinion, be capital well invested. Not only would the foundations of an alternative ample supply of food be laid, but means would be provided of pushing population into tracts of country which are now lying waste for want of labor, and sufficient labor will not come without the fruit of some tree which requires little labor and a minimum of water.

E. BONAVIA, M.D.

ETAWAH, *15th September 1885.*

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CHAPTER I.

ORIGIN OF CULTIVATED TREES.

THE mango tree and the date palm furnish us each with two main varieties, *viz.*, a *wild* and a *cultivated* kind. Both these varieties,—that is, the wild and the cultivated,—appear to be botanically indistinguishable. The principal difference is in their fruits, the wild ones having more stone or seed, and less pulp; while the cultivated varieties have more pulp or flesh on their fruit, and proportionately less stone. In addition, the latter have incomparably superior flavors.

There would appear to be little doubt that the original man, like many fruit-feeding animals, tasting various kinds, both of mango and date, discovered that some had more to eat on them, and were sweeter, and more palatable than others; naturally he would prefer the nicer varieties. He would carry their fruit hither and thither, to eat when hungry. By this means, he would unconsciously become an important disseminator of the seeds of the nicer kinds, dropping them in various places and soils. This selection (which at this

stage we might still call 'natural selection') would have given those nicer varieties a better chance of propagating their good qualities, than the inferior or acrid kinds. These would be left *unselected* in the jungle, and would have less chance of propagating their bad qualities. It is a well-known fact that seedlings generate varieties. Probably one would not be far wrong in saying, that, strictly speaking, no two individuals are exactly alike. This process of unconscious selection and dissemination of the better kinds, carried on for centuries, by the savage man, would end by developing *new* and still better sorts.

Progressing through his nomadic stage of existence, man must of necessity still have carried on this process of selection and dissemination,—sometimes unconsciously, but probably oftener—now consciously—having by this time no doubt made some shrewd observations on the natural history of these plants. Finally, when man became an agricultural animal, and had settled in fixed places, and hutted himself in the vicinity of his fields, there arose the conscious and artificial selection (that is, selection with a purpose) of those animals and plants he had for ages instinctively learnt were of most use to him. He naturally would select the sweetest and best sorts of plants for sowing round his primitive villages.

At this stage would probably have commenced the cultivated history of both these fruit trees—the mango and the date. In crossing and multiplying as before, varieties—good, bad and indifferent—would be produced. The multiplication of people, in these primitive communities, would necessitate the use of timber,

leaves, &c., for hutting the tribe, and fencing off the villages and cattle, for protection against the inroads of wild animals. In cutting down trees for these and other purposes, such as fire-wood, implements, &c., these primitive agriculturists would scrupulously have cut down those trees only for which they cared least,—that is, such as produced the worst and least palatable fruit. It will be seen that, in this necessity of cutting down trees, a selection in the opposite direction would have come into play, *viz.*, the *weeding out* of trees which either produced no fruit, or produced fruit of comparatively no value, and the *preservation* of those varieties only which gave the best, sweetest, and most pulpy fruit. Those however which may have had other useful qualities, such as that of keeping for a long time without spoiling, would have had also a good chance of being preserved. Centuries of selection and weeding would have been again necessary to give us the fine fruits, both of the mango and date, which are now to be had in cultivation over large tracts of the habitable globe. Of course this history is speculative; but knowing that both man and other animals prefer good to bad things, and that they therefore prefer sweet to acrid fruit, it does not require a great stretch of the imagination to suppose that in the beginning of time also they would have selected the nicer ones. So that the above sketch of the transition of a wild fruit to its cultivated condition, first by natural, and then by artificial selection, would appear to have some degree of probability about it.

I have entered into the foregoing speculations about the origin of cultivated plants to show—(1st) that, in the

beginning of time, it is not likely that any *cultivated* plants had existed; (2nd) if so, all present cultivated plants *must* have descended, in the course of ages, from some *wild* similar kinds; (3rd) that descent could not have occurred except by either seed-buds, or root or stem-buds. But as we know that seed-buds produce usually many varieties, while root or stem-buds usually do not, it is more probable that, in cases of cultivated plants, which now exist in many varieties, the descent has been through the agency of *seeds;* (4th) that when man first appeared on this earth, or, to speak more accurately, when he began to develop into something different from the generality of the lower animals, a source of *intelligent* selection began to appear in nature. That intelligence itself, accumulating strength and a variety of powers by natural selection, became the means of exercising further selection in the things which surrounded it, and which, from motives of taste and self-preservation, most interested it. This action and reaction (that is, of intelligence on surroundings, and surroundings on intelligence) went on, until it reached that stage which, by gradually *preserving* the good, and *weeding out* the bad, led, through inconceivable time, to our present condition; *viz.*, that of possessing a large number of useful plants and animals. Without them, one can hardly conceive man to be what civilization is making him.

Somehow tannin, acids, and sugar have played a very important part in the changes which have occurred in fruits. That is, these ingredients, by their action on his palate, must have influenced man's selection of those kinds which were sweet or agreeably acid, and

the rejection of those which were unpleasantly acrid or astringent. Some fruits always remain astringent, like the myrobalans. (These however are used for other purposes than food.) Others remain always acid, such as the lime, lemon, crab-apple, &c. Others again turn from acid or astringent, which characterizes their *unripe* stage, to sweet, when they ripen. In the latter category would come many varieties of the modern apple, the orange, grape, mango, date, &c.

It is not improbable that most fruits, when their usefulness had been recognized, became objects of some such semi-religious veneration, in order to preserve them from reckless extinction, as the cow has been, and still is, in India. The history of the apple in England also clearly indicates this. Its having been fostered in olden times has led to there being now in England alone, it is said, between 400 and 500 distinct varieties of apple under cultivation. In ancient times, it is stated, that the apple in England used to be *prayed for*, whether for its fruit, or its cider, I do not know; probably for both.

With regard to the date tree, I find the following in Sir W. Muir's 'Annals of the Early Caliphate,' page 10. About A. D. 632.—In the expedition of Osâma to the Syrian border, Abu Bekr, the successor of Mahomet, gave the following injunction to Osâma. Among other things, he is stated to have said: "*Injure not the date palm, neither burn it with fire;* and cut not down any tree, wherein is food for man or beast." It is evident that, even twelve centuries ago, the date palm in Arabia was an object of great care.

CHAPTER II.

SPECIES AND VARIETIES OF PHŒNIX.

DROPPING the mango, I now take up the date palm with reference to its future in India.

Botanists appear to have made out five or six species of phœnix in India, of which the Phœnix sylvestris and the Phœnix dactylifera appear to be only varieties of the same species. The former is the wild kind, or 'khajoor'; and the latter, the cultivated kind, or 'chohara.' This again includes over a hundred varieties, all with distinct appellations, and all bearing more or less large fruit. The cultivated kinds of date palm are grown mostly for their delicious fruit.

The wild date palm or 'khajoor' of Upper India (Phœnix sylvestris) is found more or less everywhere: in South India, in the Deccan, in Northern India. Everywhere it is used largely for tapping below the crown, to extract its sap, which is then fermented and made into what is called 'toddy.' This palm is not the *only* one the juice of which gives toddy. Various other species and genera afford a sweet sap, which can be fermented into alcoholic drinks.

In Bengal, the wild date palm is extensively planted for its sweet sap, which is boiled every morning in the cold weather and made into sugar.

About 1857-58, Mr. S. H. Robinson got a prize of Rs. 500 for the best essay on the "Sugar date palm—its cultivation, and the manufacture of sugar from its juice." After its 5th year from planting, the cultivators begin to tap it, and after three years more, it bears its full annual amount of juice. Mr. Robinson, in his essay, says, that, at one time, between 1854 and 1858, in Bengal, the production of sugar from the 'khajoor' palm averaged 35,000 tons of dry sugar, or 953,750 maunds, per annum. Plantations are made of thousands of trees, ten or twelve feet apart, and between the palms, rape, linseed, and 'til' are grown. From inquiries recently made, this industry appears to be still largely carried on in various parts of Bengal. In the Bengal Administration Report for 1882-3, it is stated that this cultivation is extensively carried on in the districts of Furreedpur, Bhaugulpur, and Jessore; in parts of the 24-Pergunnahs, Nuddea, and Khoolna. In the Bhaugulpur district, the outturn of 'gur' is established at 115,000 maunds per annum. In Jessore, it is stated, there were 24,122 acres under date cultivation in 1882-3; and the outturn of coarse sugar was 10,056 tons. The value of sugar, refined and coarse, for that district, during the year, was—

For coarse sugar, 'gur,' Rs. 20,73,642, and for 'cheenee,' Rs. 27,72,599, or a total of Rs. 48,46,241 for the one district—Jessore.* Any further information regarding the sugar manufacture, from the wild date palm in Bengal, can be obtained from Mr. Robinson's pamphlet.

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* This information I obtained from the Proceedings of the A. H. S. of India, published in the *Pioneer* of 17th March 1885.

Briefly, the date palm, besides being a most ornamental plant, is used for three important purposes, *viz.* :—

(1) The juice of the Phœnix sylvestris, if boiled down before fermenting, gives sugar and molasses.

(2) If allowed to ferment, the sugar changes into alcohol, and produces a spirituous liquor, commonly called 'toddy.'

(3) But perhaps the most important product of the date palm, Phœnix dactylifera (chohara), to large sections of mankind, is its fruit, or *date*. Of this date-bearing palm, there are upwards of a hundred varieties in cultivation.

It is said that the fruit of certain kinds of dates grown in the Persian Gulf find their way to Western India, where they are in great request by distillers of 'arack.' I suppose they are used in the same way as distillers in Upper India use the sweet dry flower of the 'mohwa' tree (Bassia latifolia).

Both the wild and cultivated kinds produce sap or juice. This juice is naturally stored up in the stem, for the purpose of leaf-making and growth of the tree; and also for the production of the fruit and its seed. The Phœnix dactylifera is, therefore, not tapped, as, the fruit being the more important product, the extraction of the sap would prevent the production of dates.

In Bengal, however, only the wild phœnix is planted, as it gives plenty of sap, and the fruit is not wanted.

Besides sugar, alcohol, and dates, this palm gives other minor economic products, such as materials for mats and ropes; for thatching and hut-building; and also for making bags, baskets, and hats or caps.

The phœnix belongs to the family of the Palmaceæ. These, in turn, belong to that large section of plants

which, like the lily, amaryllis and others, have their floral divisions in *threes*, or multiples of threes. The cocoanut also belongs to this family, but it is monœcious,—that is, it has its sexes on separate flowers, *but on the same* tree. While the phœnix is diœcious,—that is, it has its sexes not only on separate flowers, but also *on separate trees.* Agriculturally, it is a nuisance to have the sexes on separate trees, especially when the sex cannot be detected in the seed; but biologically, it no doubt has some important meaning. Probably it indicates a more highly elaborated individual.

In the Phœnix dactylifera, the male flower has three flaps or sepals, which enclose six sessile anthers, bearing the pollen. The female flowers have six bracts, forming a cup, which almost completely encloses three separate carpels, each of the latter terminating in a hair-like stigma, which receives the pollen from the male flower, and through which impregnation takes place.

Both male and female flowers are of a pure cream color. The males are in sprays of closely set flowers, while the females in long sprays of sparsely set cup-shaped flowers. After the pollen has come in contact with the hair-like tips of the female flowers, fertilization becomes completed, and eventually the carpels grow into dates. In my opinion, although it would require a lifetime to prove it, the more pollen grains come in contact with the hair-like tips, the more potently is the ovule likely to be fertilized, and the more vigorous is the tree likely to result from that seed.

Dr. King, Superintendent, Royal Botanic Garden, Seebpore, informs me that of phœnix there are found wild in India six different species, *viz.*:

Phœnix sylvestris (wild date, 'khajoor').
" paludosa (in the Sunderbuns).
" farinifera
" acaulis
" humilis
" rupicola
} dwarf species.

Mr. Ridley, Superintendent, Horticultural Garden, Lucknow, writes, that this season (1885) he has succeeded in fertilizing the flowers of Phœnix dactylifera (date) with the pollen of Phœnix sylvestris (khajoor), and that it has set fruit well. It is not impossible that some of the dwarf species of phœnix may be also crossed with the date palm. As Mr. Ridley has the acaulis in the Lucknow garden, he may yet be able to try this experiment; a dwarf variety of date palm would be very desirable.

The Phœnix acaulis, moreover, fruits abundantly in the N. W. P. and Oudh, and what is more important, it ripens by the fifteenth May, that is, four to six weeks before the usual rains commence. It turns at first red, and when quite ripe, it is perfectly black, very sweet, and with the usual flavor of ripe dates. It has, however, little or nothing to eat on it. The Phœnix acaulis date is ¾ of an inch long, and over an inch in circumference. It may be found possible, by crossing, to unite the fine qualities of the Arabian date with the remarkable earliness and dwarfness of the Phœnix acaulis.

CHAPTER III.

THE DATE PALM IN MOOLTAN, SINDH, &c.

IN Sindh and along the N. W. Frontier of India, the true date palm has flourished from time immemorial. Wishing to learn something about the history, the extent and mode of cultivation of the Sindh date palm, and of the mode of curing its fruit, I wrote to the Deputy Commissioner of Mooltan, Mr. E. O'Brien. He very kindly sent me the following information :—

"The history of the introduction of the date palm in Sindh is buried in obscurity. There are, however, two legends about it :

(1) That dates formed part of the Commissariat of Alexander the Great when he invaded India, and that trees grew from the seeds thrown away. This is, however, *very* legendary. The other (2) is that the date seeds were introduced in a similar way by the Arab conquerors of Mooltan and Sindh, in the seventh century, A. D."

To a question of mine, Mr. O'Brien replied, that "nothing can be more certain than that the present date tree has not originated from the wild one of India (khajoor), for you find the true date palm (chohara)

growing in the most barren places, what you would call 'reh' land, and apparently luxuriating in it." (If Mr. O'Brien has discovered some useful plant that will grow on 'reh' or 'oosur' land, the officials in the N. W. P. and Oudh might take the hint, and try if the oosur tracts of land might not be groved with the Sindh date palm.—E. B.)

Mr. O'Brien says, "I have tried repeatedly to distinguish between the different varieties of dates when fresh. I once had 26 so-called different kinds before me at once, and the only one that I could see that differed from the others, was called 'singastha,' which was very long, and of a light yellow. The others seemed all the same to me. I send you five kinds of dates, four of which are uncooked, that is, simply dried; and one bag of 'bhugrian,' that is, ripe dates, first boiled in water, and then fried in oil. The people from whom I have bought them do not profess to be able to give their names when dry, though, as I said, they do so when fresh. The kinds I send differ in price from 1½ anna to two annas per seer. All, except the 'bhugrian,' will germinate, and perhaps the latter may do so too, as I do not know the amount of cooking they undergo."

The samples of Mooltan dates, sent by Mr. O'Brien, reached me on the 22nd December 1884. The following is a brief description of the dates contained in each bag:

No. 1.—Dates averaged 1¼ inches long; pulp sweet, and rather skinny; seed ¾ inch long, and thin.

No. 2.—Dates averaged 1¼ inches long; soft and flattened, as if they had been pressed together; pulp very sweet and soft, and not skinny; seeds ¾ inch

long. These have the flavor of the ordinary dried dates of European shops, though they are much smaller.

No. 3.—Dates average 1¼ inches long or more. They are not out of shape by compression; pulp is soft, sweet, and not skinny, and the color is darker than that of the preceding lot; seeds ¾ inch long or more.

No. 4.—The dates are smooth, and rather small; they average 1 inch long or less; pulp soft and sweet, but not so much as in Nos. 2 & 3. The dates are not at all flattened. The seeds are about ¾ inch long, and rather stout.

No. 5—Consisted of 'bhugrian' dates. They are shrivelled, hard and skinny, and averaged from 1¼ to 1½ inches long. The pulpy part was hard and dry; slightly sweet and astringent, not unlike the 'Cabul chohara,' but the edible part was neither so thick nor so sweet. The seeds were about ¾ inch long and stout.

It will be seen that even in the dry state the varieties of Mooltan dates differ somewhat either in flavor or appearance.

The 'bhugrian' date is probably a variety which, in Arabia, does not ripen beyond what is called the 'kharak' stage. It is eaten in this apparently unripe state; but in order to make it keep, it has to be cooked in some way and dried.

Some of these Mooltan dates are very like the Muscat dates, which the Political Resident had sent from Muscat, and of which there are seedling trees now in Lucknow. Both the Muscat and the Mooltan dates (the 'bhugrian' excepted) are small. The former, however, I think were better flavored. It is not impossible that some of the Muscat varieties of dates may have, at

some former time, found their way through traders or raiders to Karachi, the distance between the two places being only that across the sea of Oman, not far from the entrance to the Persian Gulf, and thus may have become disseminated northwards, into Sindh. In Whitaker's Almanac, I find that, "so early as A. D. 664, Arabs began to make predatory expeditions against Bombay and Sindh, but that their co-religionists did not effect a permanent footing in India till the opening of the 11th century, when Mahmood of Ghuzni established himself in Lahore."

I sent all the five kinds of Mooltan dates to Mr. Ridley, Superintendent of the Lucknow Horticultural Garden, so that he might perhaps be able to compare them with varieties of Arabian dates produced by trees now under his care.

Mr. O'Brien, in his interesting communication, adds :

"The date palm grows in literally hundreds of thousands in the Mooltan, Muzaffargarh, Dera Ghazi Khan, Dera Ismail Khan districts, and perhaps in Bannu; also in Jhung, Bahawulpur, and Sindh. I can form no idea of their number, but the Government revenue, at a nominal rate of one anna per female tree, comes, in this district (Mooltan), to Rs. 12,084. There are, however, many exemptions.

"It is a tall palm and produces an edible fruit, about ¾ to 1½ inches long. From experiments made in the Muzaffargarh district, I made out the average produce of a date palm to be 20 seers; but I have seen a tree which produced three maunds of dates. The Settlement Officer here estimated the average outturn, per tree, at from 1½ to 2½ maunds, and the price at

2 maunds per rupee, thus making the value of the gross produce at from 12 annas to Rs. 1-4 per tree."

With regard to fertilization and cultivation he says:

"I have heard of owners of date palms placing a cluster of male flowers among those of a female tree, but I have never seen this done. The date tree grows everywhere, so I should think that artificial fertilization was not necessary, and that insects would do all that was wanted. The date palm grows spontaneously everywhere from seed; occasionally you see an offset planted by watercourses. With this exception, the date palm here is never cultivated. These palms are such a marked feature in the landscape of these districts, and enter so much into the life of the people, that one could not help knowing something about them, even if one had not assessed them with revenue and written endless reports about them.

"The fruit is ripe in all July and the first 15 days of August. The people eat it universally in large quantities. They eat till they can eat no more; then they eat a raw onion (I suppose as an appetizer.—E.B.), and begin to eat dates again. The great pilgrimages take place in these months, because the date-picking is going on, and the pickers are allowed to give a handful of dates to each passer-by. The fruit will last, when ripe, for six months. It is also preserved by boiling in water, and then frying in oil. In this state it will last for a year. It is largely exported into Northern Punjab from here (Mooltan). Edgeworth says that the true date palm is nowhere known in any quantity north of Tulamba (in this district) and Jhung. No part of the date tree is without a name and a use."

The following are the Mooltani names of the different parts of the date palm :

(1) Names given to the fruit at every stage of its growth—

Makorà.—The little waxy ball-like female flowers.

Gandorà.—When the date is quite hard and unripe.

Dokà.—When it turns yellow or purple.

Dang.—When one side turns brown and soft.

Pind.—When the dates are quite ripe. These are divided into two kinds—

(*a*) *Van di Pind.*—Dates of the wood,—*i. e.*, naturally ripened on the tree.

(*b*) *Pind Lúní,*—*i. e.*, ripened by being tightly closed with salt, in an earthen vessel, for a night.

Kuk (plural *Kukan*).—Dates which are shrivelled on the tree : goats are fed on them.

(2) Names of other parts of the date palm—

Buhárá.—The bunch of fruit stems. This makes a good besom.

Sip.—The spathe or cover, from which the bunch of date flowers issue (literally a shell).

Gosha.—A cluster or bunch of dates. This word is also used for other clusters.

Gatak, gakat, or *gakar*—Are terms for a date stone.

Khasi and Bogh—Are terms used for stoneless dates.*

Chhari.—The midrib, or leaf stalk of the palm.

Bhútrá.—A pinna or leaflet of the big leaf. These leaflets are made into baskets, matting, and ropes.

Thúhá.—A thorn of the date palm leaf.

Kabál.—The network of fibre, which is found at the base of each leaf stalk. This fibre is made into rope.

* That is unfertilized, or barren dates.

Gáchí.—The crown of leaves at the top of the date palm. In the centre of the crown is the 'gari'—a blanched cabbage-like cluster of young leaves, which are eaten, and much thought of.

Thadá.—A cluster of date trees growing from one stool. (These, I fancy, are the offsets which sprout round the main stem.—E. B.) From this word is formed the verb 'thadan,' to transplant date trees.

Thát.—A grove of date palms.

Torá or *Bindá.*—A bag made from the date leaflets, and hung round the clusters of dates to protect them.

Chárhá.—A date-picker (literally one who ascends).

Kamand.—The rope which passes round the palm stem and under the seat of the date-pickers. It looks most insecure at the top of an 80-feet tree, but accidents seldom happen.

Khori.—An enclosure, the walls of which are made of date leaf stalks, and within which dates are dried for exportation and market.

Finally Mr. O'Brien stated: "I spent two months' leave at Karachi, in the date season, and noticed that our Mooltan and Sindh dates were thought nothing of for exportation, at least openly. The Persian Gulf steamers took up immense quantities of the sides and tops and bottoms of date boxes. They were put together up the Gulf, filled with dates, and sent home without further change. Gulf dates could not be obtained in Karachi, except by favor from the British India Steamer Company."

CHAPTER IV.

ORIGIN OF THE DATE PALM IN OUDH.

SOME time during the year 1867, I saw, in the Lucknow Chowk Bazar, some fresh, large, yellow-colored dates, which the fruit-seller called 'chohara.' They were large and fleshy, very much more so than the fruit of the 'khajoor.' I was inclined to think that these yellow dates might have originated from seed of dates brought by Lucknow pilgrims, from Mecca, in the time of the kings of Oudh. I have sown the seeds of the 'chohara' brought to India by Cabul merchants, and not one of them germinated, so that these dates are probably what in the Persian Gulf are called *kharak pokhta*, or cooked dates.

In 1868 I read Gifford Palgrave's book, entitled "A Journey through Arabia." In it he says, that, at Djouf, he found excellent dates. "They are the bread of the land, the staff of life, and the staple of commerce." He also states that Kaseem has the best dates known anywhere. "Those who, like most Europeans at home, only know the date from dried specimens in shop windows, can hardly imagine how delicious it is when eaten fresh, and in Central Arabia." He and his companion bought a large handkerchief-full, for three farthings, and "hung it up from the roof beam of our

apartment, to preserve the luscious fruit from the ants, and it continued to drip molten sweetness into a sugary pool, on the floor below, for three days together, before we had demolished the contents, though it figured at every dinner and supper during that period." In another part of the book, having by that time tasted many kinds of dates, Palgrave says—"the 'khalàs' date is the 'facile princeps' of its kind, and bears to ordinary dates the same relation that the Bombay mango bears to the 'jungli' mango." It is grown in 'Hofhoof,' on the Eastern Coast of Arabia. Another fine kind in the same place is 'rekáb.'

Since the days in which Palgrave wrote this book, the foreign export trade in dates has, no doubt, much increased; and now probably the best kinds found, both in Arabia and Persia, are largely grown on both sides of the Persian Gulf.

It is well known that, among the poor Arabs, dates occupy the place of both bread and meat of other countries; and that the people and their camels often live upon little else. The beverages of the Arabs being coffee, milk, and water.

With Palgrave's description of these luscious kinds of Arabian dates in my head, I thought it would be a great triumph if some of these fine things could be made to grow and multiply in Oudh and other parts of the North-Western Provinces.

Being then in charge of the Horticultural Garden of Lucknow, I addressed the Secretary to the Chief Commissioner of Oudh, dated 4th September 1868, and suggested that some seeds of the best kinds of Arabian dates might be procured, through the Political Resident

in the Persian Gulf, for trial in the Lucknow Horticultural Garden. The grounds for making this suggestion were:

1*st.*—The common wild date or 'khajoor' (Phœnix sylvestris) grew well in Upper India, and natives ate its skinny fruit greedily, although it was very small and had little pulp on it.

2*nd.*—I had seen a few fresh yellow dates, of the cultivated kind (Phœnix dactylifera), in the Lucknow market, which were probably of some tree grown from imported seed. They resembled some I had seen once in Egypt.

3*rd.*—That, wherever Palgrave had seen the date palm, it was always in oases, where the trees could be properly irrigated at certain seasons, and never in deserts, as was thought in olden times.

4*th.*—That if some good kinds of cultivated date palms could be extensively introduced into Upper India and other parts, they might probably be eventually the means of mitigating famines, and so enable poor people to tide over times of drought, a much smaller amount of rainfall, than usually occurs in Upper India, being *quite sufficient* to ensure a very good crop of dates.

The Government of India approved of my suggestion, and requested the Political Resident in the Persian Gulf, Sir Lewis Pelly, to forward seeds of the best kinds.

Seeds were received in Lucknow as follows:

On the 26th January 1869—Nine kinds of date seeds, *viz.*: From *Dashtee*—seesee, khanaizee, zainadheenee, kasp, kabkàb; and from *Busra*—khudràwee, guntàr, sa'ameràn, hallowee. All those sown in the Lucknow

Horticultural Garden germinated, and the majority of those distributed to the districts of Oudh germinated also.

On 3rd December 1869—The following kinds of date seeds were received—khanaizee, kabkàb, kandee, shakar, guntàr, hallow, maksheeb, khosha-kharak, shaikh-ali, sheerinee, khàroo, jowzee, chehel Gezzee, khatoon-she-habee, neereedheenee, shahoonee, kaidee, seesee, rash, kharak-gotoo, and two more packets from Bahrain and Tangistan. The two latter were naked seeds, and all the rest *dates* with seeds in them. It had been stated that seeds sown in the fruit germinated better than naked seeds, but I do not think that this was found to be the case.

On the 29th November 1871—A bag of dates, with stones in them, was received from Muscat, as it was supposed by the Political Resident that date seeds from such a latitude might do better in Oudh. Some of these were sown in the Horticultural Garden, and some were distributed to the districts; and

On the 21st February 1872—Forty-two seers of date seeds of five named varieties were received, *viz.*: hallowee, khudràwee, sayer, zàhidee and guntàr. A sixth lot contained several other mixed varieties. Of this consignment, one seer of each bag was sown in the Horticultural Garden, and the rest were distributed to the districts in Oudh, and some to the Central Jail.

The Political Resident had stated that Arabs propagate their date palms by offsets, which can be kept, with ordinary care, in good condition, for six weeks or so, after being removed from the parent tree. Therefore, on the 31st October 1871, I asked for some of these

offsets also. I was not aware before that the date palm could be so propagated. It was also stated that the Arabs had a notion that a majority of the date palms grown from seed turned out males.

This was probably the reason which induced the Arabs to propagate solely by offsets, as the sex could then be known beforehand.

Three batches of offsets were received in Lucknow on the following dates :

On the 21st February 1872—93 offsets were received in good condition, each having three or four of the central leaves on, with a part of the stem. Most of them struck root, and therefore I thought it advisable to ask for some more.

On the 12th September 1872—30 offsets of five different kinds were received, from *Aboo-el-Haseeb*, in Busra, where the best dates in that district were said to be produced. Of each kind there was one male offset, the rest (25) were all female offsets ; and

On the 5th January 1873—100 offsets of various kinds were finally received.

The foregoing seeds and offsets I thought were ample for experimental purposes, and therefore no more were asked for. About 50 per cent of the offsets received struck root, and became vigorous plants. There are now 112 date palms from these offsets, varying from 12 to 13 years of age, and many of them have fruited. In the same garden there are upwards of 252 date palms raised from imported seed, and varying from 13 to 16 years of age. The majority are growing vigorously, and many of them have fruited. A large number of the imported offsets, and also of the seedlings, have now

offsets of their own at their base, which will be invaluable for future propagation and extension of this important tree.

The number of seedlings mentioned does not represent all that germinated in the Horticultural Garden. After I had filled all available spaces with these seedlings, there was a large number left in the nursery, which were given to any one who would take them. I lost sight of these. Probably many of them are scattered about the Lucknow district.

Incidentally it may be mentioned, that, in the official correspondence which passed through my office in those days, I had found that, on the 14th June 1871, the Commissioner of Forests of Mysore and Coorg, writing from Bangalore to Lieutenant-Colonel Lewis Pelly, Political Resident in the Persian Gulf, acknowledged the receipt of 60 date palm offsets, which were despatched from the Persian Gulf. It was stated that they arrived in good condition, and were planted out in Bangalore.

I had never heard what became of the 60 offsets which were sent to Bangalore. Latterly, however, being much interested in the subject, I wrote to Mr. Cameron, the Superintendent of the Mysore Government Botanical Gardens in Bangalore, to ask if he knew anything about them, giving him the period they were received in Bangalore. He kindly replied on the 23rd February 1885, and gave the following short history of their melancholy end :

"When I took charge of this garden in March 1874, I found a number of offsets of the 'date palm' in a dead and dying condition, and, shortly after my arrival, they were all consigned to the rubbish pit.

"The offsets had evidently been much neglected, as I found them planted at intervals in a dry exposed field, and as my predecessor died some six to eight months previously, it is most probable that the plants had not been fairly treated.

"We have no plants of the date palm in this district."

It should not be supposed that, because a plant is neglected, and dies, the soil and climate do not suit it. Not long ago I visited Bangalore, and was charmed with its quasi-mediterranean climate. I should have selected *that place* as specially suited to the introduction of the Phœnix dactylifera, both by seed and offsets.

It was risky to "plant them out" in a country where no practical knowledge of their nature had been yet acquired. In Arabia they would have met with a similar fate had they been placed under similar circumstances. The Arab 'plants out' offsets, it is true, but *then* he waters them *daily*, by hand, until they strike. The Arab well knows the value of dates. To him they are his bread. Day and night he watches over his newly-planted offsets, and probably tends them with as much care as he would his own children, or perhaps more so. Neither want of practical knowledge, nor neglect, ever spoils his work. The Arabs say, that offsets of the proper maturity can be detached from the parent tree, and left exposed for 8 or 10 weeks before planting, without any harm coming to them. I am so satisfied of their hardiness that, provided they are of the proper age, and have a good woody stump, I think they might be taken from the Persian Gulf in a steamer all round the world, and brought back to their home, and planted by an Arab, who would make them strike, and give fruit at the

proper age. In my opinion, there is no part of the world to which date palm offsets could not be taken and made to live, if the climate and soil were at all suited to such trees.

In Lucknow, I treated the offsets under my care differently. I planted them in a nursery, in a shady place, and had them carefully looked after and regularly watered. All those that struck root, and were well established—as I said about 50 per cent of the whole—were afterwards carefully transplanted into their permanent places.

With reference to offsets, I found that September was the best time for them to reach Lucknow. They then had all the cool winter months to strike in. By the beginning of the hot weather, all those that could do so would have struck root, and by frequent waterings, they would be in a fit state to be transplanted into their permanent places, when the next rains had well set in. Once rooted, they would make steady progress.

All date palms, whether grown from seed or offset, do not throw up offsets at their base with the same facility. Those which do not, make more rapid growth. This stands to reason, as when the stem is single, all the nourishment sucked up by the roots goes to develop one stem, instead of being dissipated into many buds or offsets.

To recapitulate, the present state (1884-5) of date palm cultivation in Oudh stands thus: In the Horticultural Garden of Lucknow there are—

252 seedlings from imported seed, from 13 to 16 years old;

112 palms from imported offsets, from 12 to 13 years old.

Both these lots are fruiting. There are many varieties, and the fruit of the best of them has been differently styled as 'good,' 'very good,' and 'delicious.' In addition to the above, Mr. Ridley, the present Superintendent, has lately planted (properly speaking, his *locum tenens* Mr. Reid did it, while Mr. Ridley was on leave) a grove of acclimatized seedlings, near the 'karbala,' of which there are 454 now living.

Then, in the Oudh districts, there are the following lots of date palms, from imported seed. This information has been kindly furnished by the District Officers.

Lucknow District.—In the Central and District Jails there are some date palms. Two are said to fruit in August. Natives call them 'chohara.' Besides the above, a number of seedlings were distributed to various persons in the district, but no record appears to have been kept of these.

Bara Banki.—There are 21 palms in the station, averaging from 10 to 15 feet high. They appear to have been left to take care of themselves.

Unao.—There are 185 date trees in four places. Two bore fruit, but did not come to perfection. Dr. McReddie says, the females were not fertilized. He will try to fertilize any that may come into flower in the coming season.

Sitapur.—There are 276 palms in eight places. They are of various heights ; 25 are said to bear fruit.

Hurdoi.—There are 54 in the public garden, forming an avenue ; 9 fruited in 1884, and the fruit was eaten by wasps, when they began to ripen. Bees have been observed to frequent the flowers, and probably those 9 trees were fertilized by them, the palms being close to each other in an avenue.

Kheri.—There are 219 date palms, 4 blossomed, but the blossoms withered. No artificial fertilization was practised.

Fyzabad.—In the Guptar Park, there are 51 palms, said to range from 3 to 24 feet. In the public garden there are 9, from 7 to 9 feet high. Of the former, the larger ones bore fruit, but it never ripened. Of the latter, one fruited last year, but was of inferior quality.

Gonda.—There are 48 in two places, all advanced in growth and vigorous. One flowered last year, but did not yield full and mature fruit.

Bahraich.—There are 34 palms, from 2 to 14 feet high. They don't appear to bear fruit.

Roy Bareily.—There are a few trees scattered about the station, and a few more in the district; not much is known about them.

Sultanpur.—There are 135 palms in two places, in flowering condition. From 12 to 15 have borne fruit.

Pertabgurh.—There are 218 in seven places; 26 fruited, and 113 were in flower. Dr. McReddie states that, when he was in Pertabgurh, some dates which came to perfection "were most delicious."

It appears that, in the various districts of Oudh (excluding those under the care of Mr. Ridley in the Horticultural Garden, and the 'Karbala' of Lucknow), there are at least 1,250 date palms from imported seed. There is evidence enough to show that, of *all* the date palms in Oudh, many produce good fruit. I tasted some which were sent to me from Lucknow, and I found them very good. Unfortunately those in the districts, with few exceptions, have been scattered about. It cannot be too often repeated that date trees are of two sexes. I have heard a native say "kambakt phalta

nahin."* The palm in question may have been a *male ;* and of course in that case, no power on earth could make a male date tree produce fruit, or it may possibly have been a female, with no male within miles of it. In that case, the flowers would remain unfertilized, and the fruit, if any, would be small, seedless, and bad. Even the Arabs don't eat this 'shis,' as they call it. It is given to goats.

I saw that it was important to diffuse some information on the necessity of the female flower being fertilized (either by human hands or by insects, and the wind, when males and females are close to each other), in order that the fruit may be of any use.

With this object in view, towards the flowering time in February 1884, I addressed a letter to the *Pioneer*. The editor kindly gave it a prominent place. I also asked Baboo Baleshwar Parshad, Deputy Magistrate of Etawah, who takes great interest in Horticulture, to have it translated into the vernacular. It was inserted in the *Nujmul Akhbar* of Etawah, the proprietor of which is Momtaz Ali Khan. Munshi Newal Kishore, of Lucknow, was also asked to insert it in his *Oudh Akhbar*. I took the above trouble with the same view that nature scatters seed about, trusting to the accident of any one falling on fertile soil, and eventually bearing fruit. The greatest hope, however, is to be looked for from the date palms under the care of Mr. Ridley, who understands all about them, and has an establishment under him, who by this time have learnt a good deal about date palms and their wants.

It is out of the question to expect district officers

* 'The wretched thing won't fruit.'

(unless they have a strong 'penchant' that way) to take much interest in date-planting, or any other planting. They already have their hands full of other works. When I was distributing imported date seeds in Oudh, at the period before mentioned, one of the District Officers (now no longer in India) insisted that "nothing would come of my experiment." He said, pilgrims who go to Mecca have often brought date seeds with them, and no date palms are to be seen anywhere. Putting aside the fact of the date palms being of two sexes, the chances are infinity to one that anything would ever come out of a few seeds brought by pilgrims, unless constant and special care were taken of the seedlings, *if they germinated.* Natives are too prone to leave everything to the care of God, and the omnivorous goat would not be long in finding out a green leaf, in the hot weather, even if the seed were placed, in the first instance, under favourable conditions for germination. This District Officer was, however, altogether wrong. As I said before, my attention was first called to the subject of date cultivation in Oudh, by seeing some yellow dates in the Lucknow bazar. The present state of the date palms in Oudh, moreover, I think, leaves no doubt that their cultivation in that climate is quite feasible.

Lately I was given some dates by Nawab Saif Ulla Khan, Officiating Tehsildar of Etawah. They were purchased at Medina by a relation of his, who had returned from a pilgrimage to those parts. I sowed the seed in pots, and every one of them germinated: there is no reason to doubt that if these young plants are cared for when I leave India, that at some future period fresh Medina dates may be had in Etawah. There is no

difficulty about growing the date palm from seed. It germinates as readily as that of the 'khajoor.' The plants require certain care after germination.

Another District Officer, who has now also left India, and to whom I had sent some Muscat dates with the seed in them, with a forwarding letter of instructions, came to Lucknow some time after. I asked him whether he had received the packet of dates I had sent him. He said, "What dates?" I replied that, in such a month, I had sent him a packet of dates for sowing, which were of a lot I had received from Muscat. He said, "Oh! yes, I now remember a packet being put into my hands. I opened it, and found it contained dates. I ate them, and found them very nice." I asked him, "And what became of the seeds?" He replied, "I am sure I don't know!" Sir Joseph Hooker, in writing to me about date palms, said: "It has always appeared to me to be a great pity that the Forest Department should not do a little of that sort of work, and not be confined slavishly to tree culture and conservation."

The person who undertakes to introduce any new tree into a place, must have an *interest* in making it succeed.

CHAPTER V.

CULTIVATION AND PROPAGATION OF THE DATE PALM IN THE PERSIAN GULF.

WITH the batch of seeds which reached Lucknow on the 3rd December 1869, a précis on the cultivation and propagation of the date palm in the vicinity of Bushire was also forwarded by the Political Resident of the Persian Gulf. It was compiled by the Assistant Resident, Mr. James Charles Edwards, from a number of reports received from various places, such as Busra, Bahrain, Konar-Tukhat, Dashtee and others, and was dated Bushire, 23rd September 1869. It contained the following information, which I give 'in extenso,' so that it may be compared with another Memo. received recently, and given further on:

"The offsets which appear at the foot of the date tree are removed when the woody stem is about a foot long, as under this size it is said they are likely to die before striking. They are planted wherever they are ultimately wanted, in a grove, the soil being kept moist for two or three years after. When they strike, a bed (thala) is made round the base of each plant, and filled with decayed horse manure. Where water is plentiful and the soil open, the palms grow rapidly, and begin to fruit about the 4th or 5th year after planting. On the contrary, where water is scarce and the soil hard, 10 or 12 years may elapse before they fruit.

"The Arabs prefer planting offsets, as they cannot rely on the fruit of seedling palms coming true,—that is, exactly like the fruit of the parent palm. Some say that, if the seed is planted with the fruit pulp on, it germinates sooner, and the seedling thrives better than when the seeds are sown *naked*. All, however, agree that offsets are the best, and that they are stronger and more productive than seedlings. It is stated that these offsets are extremely hardy, and may remain for 8 or 10 weeks exposed without injury. Their weight, when separated from the parent palm, should be about 6 lbs.

"The date palm blossoms in February. The flowers, both male and female, are, at first, enclosed in a spathe, like a sword scabbard. Afterwards, the spathe bursts by the growth of the blossom, and a bunch of white-colored blossom comes forth. The number of flower bunches on each tree varies from 12 to 24, but seldom more than 12 bunches are eventually left on the tree. The flower of the male tree has a reddish tinge.

"At this period the cultivator artificially fertilizes the female blossom. He takes a few sprays of male blossom from the *male* bunch, and ties them in each *female* bunch. Where date palms are thickly planted, with many males among them, the wind is said to carry the pollen from the male to the female, and so produces natural fertilization. But should this not occur, the fruit is seedless, and insipid. The blossom of the date palm in Persia is called 'thareh'; the male, 'nur'; the female, 'madeh'; and to fertilize is 'boodadan.'

"About May the fruit begins to form, and in September it is perfectly ripe. Between these periods the tree sheds its superabundant dates,—that is, all the fruit

which the strength of the tree is unable to support. The dates that fall at this period are eaten, either by the proprietor, or the man employed to tend the trees. These droppings are green, and are called 'khamàl.'*

"In June and July the fruit becomes either red or yellow, or shades thereof, according to variety, and at this stage it is called 'kharak.'† It is then fit to eat, and what is saleable, is cut down.

"In August the fruit becomes sweet, soft, and juicy. It is then called 'rutub,' and is sold in the bazars. At this stage, however, it is not fit to keep beyond two or three days, as it easily ferments and turns sour.‡

"In September the date ripens thoroughly, and is fit to prepare for keeping a long time. At this stage it is called 'khoorma.' It is removed from the tree and gathered in troughs, and exposed to the air and sun, where it throws off its extra juice, and becomes drier and harder. In this state it admits of being packed in baskets and prepared for exportation.

"The juice of the 'khoorma' dates is gathered and used, under the name of 'doshab,' by the poorer class, instead of sugar. This juice is also used in preserving dates in jars, by mixing up, with the dates and juice sesame (til seed), powdered ginger, and broken kernels of walnuts. This kind of preserved dates is called

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* It will be observed that dates are edible even in their *green* state.

† The 'kharak,' or unripe stage, is first astringent, and then sweet and nutty. The latter is eaten very largely without cooking. In the date season, the people live principally on 'kharak' dates and fish. All dates, of *whatever kinds*, pass through the 'kharak' stage.

‡ 'Rutub' is the first stage of *all* those kinds which ripen on to the *perfect* date or '*khoorma*.'

'khoorma sheerah.' It is used locally, and also exported.

"There are certain kinds of dates called 'baraimee,' which do not ripen beyond the hard, or 'kharak,' stage, which is either red or yellow. In order to preserve such kinds, they are first boiled in water, and then exposed to the sun and air till they harden. They are then called 'kharak pokhta.' If well packed and kept dry, they will thus keep for some time. If packed in air-tight tins, in a dry climate, they will keep for an indefinite time.

"Other kinds do not ripen beyond the 'rutub,' or sweet and soft stage, which occurs in August. These varieties are called 'zàhidee.' They are allowed to remain on the tree till they are hardened by the air and sun. They are then collected and packed in baskets. These kinds are not much used in the Persian Gulf, as they find a profitable market in India, where they are in great request by distillers of 'arack.'

"More than a hundred varieties of dates are known by distinct names. The prices of the dates vary according to name and kind. The varieties found about Bushire are: 'khanaizee,' 'kabkàb,' 'kandee,' 'shakar,' 'guntàr,' 'hellow,' 'maktoom,' 'khosha-kharak,' 'shaikh-ali,' 'sheerinee,' 'khatoon-shehabee,' 'neereedheenee,' 'shahhoonee,' 'kaidee,' 'seesee,' 'rash,' 'kharak-gootoo.' But in Bahrain, Kuteef, El Hasa, and Busra, there are a great many more kinds, all distinguishable by separate appellations.

"Prices of dates vary in the ratio of 1 to 4. The best description comes from El Hasa, known as 'khalàs. These are packed in skins of 70 to 120 lbs., and this year

(1869) may be priced at the average rate of 15 krans per 124 lbs. The next in quality is the 'kharak pokhta,' valued at 12 krans per 124 lbs. The 'hallow' from Busra claims attention next, and is seldom sufficient to supply the demand. Its value is from 6 to 7 krans per basket of 140 lbs. The 'zàhidee,' procurable at Busra, is about on a par with the 'hallow.' The 's'aàmeràn' from Busra is very common, and commands from 4 to 5 krans per basket of 140 lbs.

"The kran is equal to 6 or 7 annas of Indian currency according to exchange. The prices are only for 1869. Each year's prices of the different kinds are regulated, not only by the supply and demand, but also by the craft available for export.

"The date palm is of immense importance to the poor. They feed on the droppings of the trees from May to September, and keep the produce in various ways for the next seven months. The leaves supply fuel and material for hutting; the bunches of fruit stems make good brooms; and the leaflets make rope or matting of a very superior quality. The stems of the palms are cut up and used in various ways for house-building. The date palm is called 'nukhul'; the stem, 'jeddoo'; the woody midrib of the leaves, 'gorz'; the base of the midrib used for fuel and floats of fishing nets, 'tapool'; and the leaflets are called 'peesh.'

"Toddy is not extracted from the Arabian date palm. This could be done, but only at the expense of the fruit."

CHAPTER VI.

PROGRESS OF THE IMPORTED DATE PALMS IN OUDH.

THE foregoing information, which, as I said, had been received with a batch of seeds in 1869, was not then immediately utilizable, and was safely put by with the file of correspondence on this subject.

In 1877-78 I left Lucknow; and Mr. Ridley, my assistant, took charge of the Horticultural Garden, with all that belonged to it.

Latterly, in 1884, in reading the annual reports of the Lucknow Horticultural Garden, I found that many of my old friends, the Arabian date palms, both from seeds and from offsets, had arrived at an adult age, and many of them were producing fruit in quantity. There were, however, some difficulties in preserving the fruit from wasps and other intruders, when the dates began to sweeten and soften.

On one occasion, the head 'mali' of the garden, to indicate roughly the size and weight of the bunches, told me that many of the bunches were each "ek admi ka bojha" (a man's load). I was also informed that the year in which the crop of dates was best, was 1878. In that year *there had been very little rain in Lucknow before October.*

Under these circumstances, I thought the time had come when some further information about date culti-

vation would be of advantage, to give completion to an experiment in which I had so much interested myself. The date fruit was not only of great value to the people of the Persian Gulf, but also an important article of export. I therefore addressed Government on the 23rd January 1884, and suggested that, as now the date palm, which I had been instrumental in introducing, had established itself in Oudh, and many of the trees had been fruiting for several years, it was important to obtain from the Persian Gulf further and detailed information regarding the cultivation of the date tree, and especially the curing and preserving of the produce.

I was then requested to formulate the questions which I thought desirable should be addressed to the Political Resident of the Persian Gulf. This I did.

In the meantime I studied the subject more fully.

Mr. Ridley, in his annual report for 1881-82, stated that some of the bunches of dates were of good size, and yielded very good fruit; that the size, shape, and color of the dates prove the trees in the garden to be a collection of several different varieties. In his report for 1883-84 he stated, that there had been 83 date palms in flower—40 females and 43 males, and that, probably, this number did not represent even half the number of date palms in the Horticultural Garden.

Mr. Reid, who in 1884 was officiating for Mr. Ridley, in a letter to me, stated, that "one peculiarity of the date trees in the garden is, that no two trees give precisely the same kind of fruit. Some are apparently worthless varieties, others indifferent, some good, and a few excellent. Until the ripe fruit of all can be procured and tested, any judgment passed upon them must

be tentative and speculative. The trees appear to be of 'late' and 'early' kinds, and so far it is only a very small percentage of the fruit of the latter that has come to maturity." In another letter Mr. Reid stated, that "the dates just begin to ripen at the commencement of the monsoon (say in July), when the rain rots them at once. A few, perhaps one per cent, ripen before the rains, and these are delicious; but the wasps, bees, &c., that attack them, render even their preservation a difficult matter."*

Now there are, as mentioned in these reports and letters, various statements which, I think, require careful sifting—

(*a.*) There are now, in the Horticultural Garden of Lucknow, 112 date palms from imported offsets, and at least 252 date palms raised from imported seeds. All these (364) are between 12 and 16 years of age, and many of them have been flowering and fruiting.

(*b.*) In the Persian Gulf there are upwards of a 100 varieties of date palms, each with a distinct appellation. As will be seen from previous statements, among the seeds alone, which were received from the Persian Gulf, at least 26 packets were of *named* varieties; besides these there were bags of *mixed* seeds.

(*c.*) Mr. Ridley stated that, judging from the size, shape, and color of the dates, there must be a collection of several varieties, and that some of the bunches were of good size, and yielded good fruit.

* Wasps are much attracted by "mithai" in the bazars, and traps for them might be divised with something more *attractive* than dates, suspended on each fruiting palm, at the ripening season.

(*d.*) Mr. Reid stated that no two trees give precisely the same kind of fruit. Of those that had fruited, some were apparently worthless varieties, others indifferent, some good, and a few excellent. Some were late, some early. That those that ripened early were delicious. But that generally they ripened at the commencement of the monsoon, and that the rain then caused them to rot quickly. That fruit-feeding insects destroy the dates.

There is no doubt whatever that there is in Lucknow a fine collection of date palms of many varieties. I consider that the more varieties one commences with the better; varieties can adapt themselves to various conditions of soil and climate, especially when it is already recognized that there are some which ripen their dates earlier than others.

But to test further the fruit of these date trees, and to observe the effect of dampness on them, I obtained some from Lucknow. The season was most favorable for making such experiments. It was in 1884—a year in which there was heavy and abundant rain in the N. W. Provinces. The dates arrived on the 5th August, which might be called the heighth of the rains, in that year at all events. I received two packets.

(A) *Dates from offsets.*—Of these, some arrived quite ripe and of a dark mahogany color. They were very sweet and soft, but certainly not at all rotten. They were evidently in their 'rutub' stage. The others were greenish yellow, and unripe. All appeared to be of the same size, and the latter, as they ripened, acquired the same dark mahogany color as the others. I weighed one of the greenish ones. It gave over 1⅜ tolas (tola

is a rupee's weight), and was 1¾ inches long and 3¼ inches in circumference. The unripe dates of this packet had the crisp consistence of the 'bair' fruit, with a pleasant, sweetish, *nutty* flavour, which improved on further acquaintance. Whatever may have been the nature of these, they were certainly not rotten on the 5th August (usually the most rainy month). I kept the unripe ones for several days, and by degrees they ripened, and turned brown, soft and sweet.

(B) *Dates from seedling trees.*—These were smaller than the (A) lot, and appeared of two kinds : (1st) a tan-colored variety, nearly 1½ inches long and 3¼ inches in circumference. They had the shape of pigeon's eggs. (2nd) a variety with a reddish hue. These averaged 1¼ inches long and nearly 3 inches in circumference. They looked like large olives. Both these varieties had no ripe ones among them. They had the same crispness and sweetish, nutty flavor described before. It was evident that these also, on the 5th August, were not rotten. I kept these seedling dates up to the 24th August. Some days after arrival they began to shrivel, and ripen by ones and twos, till, on the 24th, some were over-ripe and rotten ; some were just right,—that is, quite ripe and sweet (of these, I wished I had more), and others were still unripe, but sweeter and more nutty in flavor than before. From the date of arrival I kept them all on plates on a table, with damp air blowing through the house. (Natives said they had not had such rain in Etawah for seven years.)

In the meantime, the précis (given previously 'in extenso,' and which I thought had been lost) was unearthed from the records of my old office and sent to

me. It proved the key for unravelling some of the statements in Mr. Reid's letters. I knew that even the fruit of the *wild* date, 'khajoor' (more seed than fruit), was not worthless to poor natives, as they ate it greedily; and therefore I was surprized to hear that there were any worthless varieties among those imported from the Persian Gulf. After reading the précis carefully, I was very forcibly struck—(1st) that what Mr. Reid had called 'worthless dates' were simply the 'seedless, insipid, *unfertilized* dates' of the Arabs. The great probability is that the female flowers of those trees had not been fertilized at all, either naturally or artificially. (2nd) That some of the Lucknow varieties are of the class which Arabs call 'kharak,'—that is, such as do not soften, but remain hard and nutty (something like 'bair' plums), and are sold in the Persian Gulf, and eaten there as *fresh crisp dates*. It is evident that, in their 'kharak' stage, dates are quite edible, palatable, and nourishing. This stage in Lucknow occurs before the rains, or at their commencement. (3rd) That others of the Lucknow collection probably belong to a class which ripen only to the 'rutub' stage,* which is brown, soft and sweet. This class of dates† even in the Persian Gulf cannot be kept more than two or three days, as 'they turn sour.' Finally, whether there are in Lucknow any kinds which ripen to the stage of 'khoorma,' I do not know. Probably, for this stage to come to perfection, a drier atmosphere may be necessary.

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* This appears to be only the *first* stage of 'khoorma.'

† Properly speaking, 'in this stage of maturation.'

This, however, appears to be certain that the collection of trees of the Phœnix dactylifera in Lucknow is a grand one, and embraces a large number of varieties, which will require some years of very careful observation and study to classify, and find out their exact worth.

In the Lucknow Garden, the date palms are now on the lowest, and during the rains, the dampest ground. In addition, they are all more or less surrounded by dense vegetation. (For want of space this could not be avoided.) So that it is no wonder that, in heavy monsoons, during ripening time, they are surrounded by a damp atmosphere, which may be injurious to perfect ripening. Wherever the monsoon prevails, high open ground would undoubtedly be the best position for date palms, provided they can be irrigated when necessary. Moreover, the date palm is not a low creeping thing, but every year it raises its head higher and higher above the surrounding trees and country, up to 80 feet or more. The higher it grows the drier will be the atmosphere it gets into. It is well known that even the height of a second story is sufficient to raise one above the chilly dampness of malarious districts.

CHAPTER VII.

DETAILED INFORMATION REGARDING CULTIVATION OF THE DATE PALM IN THE PERSIAN GULF, AND MODES OF CURING ITS FRUITS.

ON the 1st July 1884, Lieut.-Col. E. C. Ross, C.S.I., Political Resident, Persian Gulf, and H. M.'s Consul-General for Fars, forwarded to the Secretary to Government, N. W. Provinces and Oudh, from Bushire, a memorandum embracing replies to my questions and other information. This memorandum was prepared by A. R. Hakeem Khan Bahadur, Assistant to the Political Resident. It contained the following information, which I give 'in extenso:'

(*A.*) *Means of preventing depredations of wasps, &c., when dates begin to ripen.*

"In these districts, where plantations are on an extensive scale, cultivators do not think seriously of a small loss by depredations of wasps, sparrows, crows, bulbuls, &c. In the olden times, the demand for dates being only local, even strangers were allowed to go into the plantations, and help themselves to dates 'ad libitum.' The foreign demand for the best dates, especially for shipment to Europe and America, having in latter times greatly increased, much more care is taken of the crop, and strangers are kept out of the plantations." There is, however,

a certain indifference to the inroads of animals, which the writer attributes to indolence, and to the difficulty, and perhaps expense, of providing against loss from this source. He says : "The wants of the people are few, and at present they get enough to live on ; therefore they do not usually trouble themselves to invent remedies against such sources of loss. But in cases where palms are few and the varieties *choice*, the bunch of ripening fruit is enclosed in a gunny bag, and its mouth is tied round the main stem of the bunch. At Bustak, Gowda, Jenna, and other inland districts on the Persian main land, where dry hot winds prevail, the fruit is allowed to ripen and dry on the tree, and in order to prevent injury from the hot wind, as soon as the fruit becomes sweet, but before it softens and becomes juicy, the bunch is wrapped up in the leafy twigs of a perennial bush, called 'salm,' and securely tied, until the fruit is quite ripe and fit to cut. In the district of Minàb, bears sometimes eat the fruit. To prevent this, thorny bushes and twigs (such as 'babool' and 'bair') are tied round the palm stem, at some height from the ground. Against a flight of locusts, the cultivator is perfectly helpless. Horrible noises are made to drive away the locusts, and smoke is created by burning all sorts of rubbish, but all efforts are of little or no avail. When the locusts alight on a date palm, they devour not only the fruit, but also the green leaflets, in a very short time."

(*B.*) *Methods of curing and preserving the dates.*

"There are two stages of the fruit in which it is cured or preserved for market,—1st, in the 'khoorma' stage, when the date is ripe and sweet, soft and juicy ; 2nd,

in the 'kharak' stage, when the date is unripe and hard, crisp and dry."

(I.)—*'Khoorma' preparations.*

"The 'khoorma' is cured thus :—As soon as the dates become sweet, soft, and juicy, they are gathered and placed in a 'madibsah'—a sort of 'pucca' masonry tank lined with 'chunah' (lime). They are there left exposed to the sun and air, to throw off their super-abundant juice, which runs out, by a spout, at the bottom of the tank, into a 'ghara' buried in the ground. (If the juice is slow in running, a little warm water poured over the heap will increase its flow. Such dates however are then more tasteless and of inferior value.)

"After lying two or three days in the 'madibsah,' and when the dates become sufficiently dry and hardened, they are removed, and packed in palm-leaf bags for exportation. If there are no ready purchasers, these bags are placed in a room, called 'kandool,' in heaps of 15 to 20 bags, and allowed to drain further. The floor of the 'kandool' is furnished with channels, which lead the juice into a 'ghara' as before.

"The best method, however, of curing dates is the following: As soon as the dates become 'rutub,' that is sweet, soft, and juicy, they are picked off the bunches, and spread on the floor of an enclosed plot of ground, firmly beaten and swept clean, called 'mustah.' A better and cleaner way is to expose the dates to dry on coarse palm-leaf mats, called 'jhowlies,'* spread on the floor of the 'mustah.' After exposure from three to five days, they are collected and packed in baskets.

* Or da'oon.

"The varieties cured in the foregoing way are the following :—

"*At Busra and Mohammerah.*—Guntàr, khudràwee, hallowee, 'baraimee,' dairee, shakar, sa'ameràn, kabkàb, zàhidee, sàyer. The following, although generally used in the 'kharak' state, are sometimes also cured as the above, *viz.:* barahee, jowzee, looloi, khassàb, hamràwee, firsee, shirsee, asgar, &c.

"*At Dashtee.*—Seesee, khanaizee, zainadheenee, kasp, kabkàb, kandee, shakar, guntàr, 'hallowee,' muktoom, shaikh-ali, khàroo, sheerinee, jowzee, shahhoonee, kaidee, rash, &c.

"*At Batinah and the Oman Coast.*—Mosalla, salàni, khanaizee, 'hilàlee,' khassàb, 'maisalee' (principally made into kharak), baranee, sarashee, 'maznàj,' fardh, khamree, nakhal, khalàs, abu-naranjah, &c.

"*At El Hasa, Katif and Bahrain.*—Khalàs, khanaizee, marzaban, hallowee, khassàb, &c.

"*At Minàb, Bunder-abbas and Shamilat.*—Khanaizee, murda-sang, 'hallowee,' marzabàn, azàd, zarrak, shakaree, ab-dandàn, mandal, kalak-soorkh, malak-soorkh, shaikh-kamàli, dang-safèd, chattàn, hallow, ali-mehtari, soorkh-dang, mosalla, mosallèe, nakhal, shahree, sa'ameràn, &c. There are other varieties, not well known, which are comprised under the general term 'khàroo.'

"At El Hasa, the best dates, principally 'khalàs,' are packed in skins of 70 to 120 lbs. for exportation. At Bahrain and Katif, 'khalàs' and other dates of superior quality are put in small jars, and mixed up with sesame seed (til) and powdered ginger. The jars are then sowed up in palm-leaf matting.

"Since European and American firms have commenced exporting dates, another system of packing has been adopted. The best dates* are packed in deal boxes of various sizes, brought ready-made from those countries. (Mr. O'Brien says that, when at Karachi, he observed that the pieces for these boxes were taken by the British India Co. steamers and put together up the Gulf.—E. B.) 'Hallowee' dates are also carefully packed in small *card*-boxes. Then from 10 to 15 of these are put into a larger deal box, and nailed down.

"The best dried dates, and especially those allowed to dry on the tree, are carefully picked by a large number of laborers, principally women, employed for the purpose. A certain weight, intended to fill one box, is then taken, and the dates are carefully packed one by one, in a box lined with paper, and the lid nailed on for exportation.

"The owners of plantations have other modes of curing fresh dates and making preserves, in small quantities, for domestic use, presents to friends, and to some extent also for sale. They are the following :—

"*Khoorma sheerah.*—This is usually made of murdasang and khanaizee dates. The finest specimens of these kinds are collected and well dried in the sun by exposure on mats by day, and protection from dew by night. Then, to free them from dust, they are washed with diluted date juice, and after draining, mixed up with sesame, ginger powder, walnut kernels, &c. Finally, they are packed by pressing in jars. This done, a quantity of undiluted date juice is poured over them, and the whole made airtight. This compound is much prized by natives.

* *i.e.*, hallowee, khudròwee, zàhidee, and sayer.

"*Khoorma seh-roza.*—This is so-called from being fit to eat, three days after potting. It is a special preparation, made at Minàb, from 'hallowee' dates. The fresh 'rutub' dates are taken, and the skin removed by means of a palm-leaf spine. Then the coarse but soft layer of pulp is removed; and, finally, the firm white pulp is separated from the stone and collected in small earthen pots. The mass can be rendered palatable by adding pistachios, almonds, and condiments. This preserve is considered a great delicacy.

"*Khoorma post kandah.*—As above, the skin of the 'rutub' dates is removed; the stone is then pushed out by the same spine, and the dates are packed in large earthen jars. Skinned dates can be prepared from all good varieties, but usually *hallowee* dates are used for this kind of preserve."

(II.)—'*Kharak' preparations.*

"*Morabba khoorma.*—The 'hallowee' dates are taken in their 'kharak' or unripe and hard state. A small slice from both ends is cut off and the stone pushed out; then each date is punctured all over by means of a spine; afterwards they are well dried in the sun. Sometimes the stone is replaced by an almond or pistachio.

"Another form of the above is the following: The 'kharak,' prepared as above, is boiled in sugar syrup to a sufficient consistence, and then packed in jars. It will keep for any length of time.

"*Madgoogah.*—The sweet fresh 'kharak' is broken up, and the stones removed. It is then dried in the sun for five or six days. Afterwards it is pounded in a mortar, and put into boiling date juice, and mixed with sesame,

cardamoms, cinnamon, &c. The whole is stirred on the fire while boiling. When removed from the fire, the stirring is continued till the mass cools. Finally, it is packed in jars for use." (This appears to be a sort of Arabian jam, flavored with condiments.—E. B.)

"Another mode of preparing the unripe date for commercial purposes is :—

"*Kharak pokhta.*—It is made as follows :—When the 'kharak' has become sweet, but *before it has begun to soften*, the whole bunch is cut off, and immersed in large copper pots of boiling water, in which it is allowed to boil till the stones assume a reddish color. Then the bunches are removed and exposed on mats to dry in the sun for eight or ten days. Afterwards they are picked off the stalks, and allowed to dry still further. Finally, they are put in bags for export.

"The fruit of *all* the varieties of date palm can thus be converted into 'kharak pokhta,' or cooked dates. It is dry, hard, and sweet. Although, of course, not so good as the preparations of 'khoorma,' which are soft and very sweet, nevertheless, by this method *all* those varieties of dates which do not ripen beyond the 'kharak' stage can also be cured and preserved for some time." (The Mooltani 'bhugrian' dates are prepared in this way, and I doubt not that the 'chohara,' brought by Afghan merchants, are also prepared in a similar manner.—E. B.)

"At Busra, 'kharak pokhta' is prepared in comparatively small quantities, from the following varieties : baraimee, sa'ameràn, kabkàb, maktoom, and shakar. Baraimee yields the best quality. It is said that the whole crop of this variety is converted into 'kharak

pokhta.' Its price is two or three times more than that prepared from sáamerán, which is also abundant.

"At Minàb, the best 'kharak pokhta' is made from 'hallowee' dates, but it is not made in large quantities. There, 'zarrak' and 'sàyer' dates are mainly prepared in this way.

"At Lar and its neighbourhood, 'kharak pokhta' is made from 'shahoonee' dates, and the process is a little different from that previously described. The fresh 'kharak' is first boiled and dried in bunches as before; after picking off the dates, the stones are removed as previously described, and then the dates are strung, like beads, into long necklaces, and hung up to dry. This 'kharak pokhta' is of yellow color and of good taste.

"From various causes—such as imperfect fertilization, insufficient strength in the tree to carry the whole crop, &c., a certain proportion of the dates do not attain maturity, and fall off in a half ripe state, becoming dry and skinny. These are called 'salang,' and are mainly given to sheep and cattle. Sometimes they are boiled with the stones of other dates, and used as a nutritious food for milchcows."

(*C.*) *The age at which offsets should be detached from the parent tree for transplanting.*

"It is the *size* and *vigor* of the offset, and not its *age*, which decide its fitness for being detached and transplanted. From various unfavourable circumstances of soil, watersupply, &c., the offsets frequently remain small and weak, and therefore unfit for transplanting. Under favourable circumstances, however, an offset three or four years old is large and vigorous, and does not

usually suffer by being detached from its parent, and separately planted. If sufficiently cared for after planting, it usually strikes root, and survives. The average weight of an offset suitable for removal should be about 6 lbs., or 3 seers. Heavier weights are, however, preferable, as, after planting, such offsets grow vigorously and rapidly, and require little more than ordinary care to bring them to a fruiting age. It is stated that, sometimes, even offsets which have fruited before removal have been carefully separated and rooted with success."

(*D.*) *Method of fertilization.*

"The Phœnix dactylifera being diœcious,—that is, having the male and female flowers on *separate* trees,—*artificial* fertilization becomes a necessity, and is the means of *ensuring* a crop, especially where the male trees are far from the females, or not in the way of winds or insects. The latter agents are not considered sufficient by the date-cultivators of the Persian Gulf, as when artificial fertilization is not resorted to the fruit yielded is abortive or blighted, with little flesh, without stones, and *totally insipid.* Under these circumstances, it is called 'shis.' Therefore human agency, or artificial fertilization, is considered essential to a good crop of first class dates.

"This important operation is performed in the following manner: As soon as the spathe, or covering of the bunch of male flowers, has attained its full size, and has come to maturity, it is detached. Its maturity is known by a faint rustling sound, elicited when the central part of the spathe is gently pressed between the fingers. Also if a slit is made in the margin of the

spathe, so as to expose the flower, a peculiar odor is detected. When the bunch of mature male flowers is detached, the spathe is split open, and the sprigs of male flowers are carefully removed and placed in a basket, which is then suspended, and protected from draughts, so as to prevent the pollen from being scattered. The male flowers are allowed to remain so for twenty or twenty-four hours before being used.

"As soon as the female flowers have burst their enveloping spathe, the cultivator considers them fit for impregnation. He then takes with him a number of male sprigs, climbs up the female tree, and inserts one or two sprigs of *male* flowers into each bunch of *female* flowers, securing them with a strip of date leaflet. If the cultivator finds that some of the more forward female spathes have not yet burst, to save himself the trouble of reclimbing, he slits them open, and inserts the male sprigs as before. Only very small and backward spathes he leaves for a subsequent operation, when he thinks them sufficiently matured. Eventually he does not allow more than twelve bunches of dates to remain on each tree, out of the twelve to twenty-four which the date palm often bears. Each palm is capable of bringing to proper maturity only a certain number of date bunches. If more are left, many of the dates drop off, and the remaining ones are of small size. Moreover, in the next year, the yield of fruit becomes much less. Usually eight to twelve bunches are allowed to remain on the tree. As the dates swell, he removes the weakest bunches, and the unripe dates are consumed by his people and friends.

"The male sprigs, with their pollen, can be kept in

good condition for fertilization in a dry form, for one or two months, and used as occasion demands. They should, however, be slightly moistened with water before using, to prevent the pollen from being scattered too freely and blown away by the wind. When male flowers are not to be had in sufficient quantity at Kharg, the cultivator imports them from Busra. It is stated, however, that pollen of one year cannot be preserved in a fertile condition for the next year.

"When the female flowers have been thus fertilized, the supply of water to the trees is cut off for a time, varying from one-half to two months, as an excess of water is said to be detrimental to proper fertilization."

(*E.*) *General method of cultivation of the date palm for commercial and economic purposes.*

"The date palms are planted in extensive groves, for facilities of tending the trees and collecting the fruit. Spots are selected where abundance of water is available in the shape of either river, spring, or well water. In other places where there is scarcity of water, such sites are selected as admit of being irrigated from rain torrents during the rainy season.

"The palm groves consist of from 80 to 200 trees, planted in regular rows, twelve to fifteen feet apart. The grove is surrounded by a high 'bund,' for purposes of admitting and retaining water in the grove. For the purpose of regulating the irrigation of the palms, the 'bund' is provided with inlets and outlets, to admit and get rid of excess of water, especially that from rain torrents.

"For the first two or three months after planting, the offsets are watered separately and daily (or when-

ever necessary) *by hand*, by means of buckets, or 'gharas' or 'beshtis,' or otherwise. Care should, however, be taken that no mud or earth get into the heart of the offset, as this proves injurious. After the offsets have struck root, they are watered weekly, fortnightly, or at longer intervals, according to need. It is essential, however, that they should get a *full* watering at least once a month. When they have grown and attained some age, they are watered thoroughly once a month, and that during the hot dry months only. At Busra, where river water is abundant, deep and wide trenches are dug between the rows of palms, and filled with water when palm irrigation is required. The water filtering through the earth of the trench reaches the roots of the trees. Where water is scarce, it is conducted by means of small channels to a 'thala,' round the foot of each tree, the soil having been previously well dug and loosened round the stem. Vegetables, lucerne, &c., are grown at Bahrain, between the rows of palms, as cultivation, by loosening and manuring the soil, acts beneficially. In any case, the soil between the rows is ploughed and turned once a year.

"With regard to manuring the date palms in places bordering the sea, fins of 'awal' or 'lookhm' (species of ray fish) are used, two or three bits being buried at the foot of each palm, and watered till they decay and disappear. In other cases, the fins are allowed to macerate in a tank, and the water used as liquid manure. In certain places, the dung of cows, sheep, goats, &c., as well as sweepings, are used for manuring date palms.

"The best places for date plantations are Busra, Mohammerah, and Minàb, along the river banks, which

abound in alluvial soil. Excess of water, however, is said generally to spoil the fruit. And if the plantations become flooded by any unusual rise of the river, and continue so for any length of time, not only the crop of dates is spoilt, but the trees also have been known to die. Damp air, when the fruit is forming, is also said to be prejudicial, as then a great deal drops off in a green state. This green date is called 'khamàl,' and is given to sheep and cattle. Poor people also eat it with fish. Dry winds are said to be the most beneficial for the proper development of the dates.

"Every year as the palm grows, the lower whirl of leaves turns yellow and withers. The decayed leaves are then chopped off. The midribs, or leaf-stalks, called 'gorz,' are made into 'jhowlies' for covering sheds, roofs of huts, and for various other economic purposes. The lower and thick parts of the midribs called 'tapool' are generally used for fuel. The broader and lighter ones, however, are made into floats for fishing nets.

"The green flower spathes, when beaten with wooden mallets, yield a quantity of fibre, useful for rope-making. When dry, they are used for fuel, but if macerated and softened by water, and then beaten, as before, they will yield a fibre also fit for ropes. From the fresh spathes called 'tara' is obtained, by distillation, *tara-water*. It has a strong but agreeable scent, and is mostly prepared at Busra and Bahrain. It is sold in carboys at 1½ to 2 rupees each, and used for making sherbet. It is greatly prized by Arabs and Persians.

"The young offsets, if not wanted for propagation and for making new plantations, should be removed from the foot of the stem in the spring of each year, as they take up the vigor of the main stem and prevent it from growing rapidly. For similar reasons, the buds or offsets, which sometimes are developed on the crown or stem of the date palm, should be also removed. If left on, they will eventually flower and yield fruit, but this will be at the expense of the main stem."

CHAPTER VIII.

COMPARISON BETWEEN THE PERSIAN GULF AND MOOLTAN MODES OF CULTIVATING THE DATE PALM.

IN the Memos. received from the Persian Gulf are given in detail the modes of cultivating the date palm by the Arabs and Persians, besides other important and interesting information. In the letters received from Mr. O'Brien, we have the mode of dealing with the date palm practised in Mooltan, Sindh, and adjacent countries.

Here then are two countries in Asia, not far from each other, especially by sea, where the true date palm grows in unlimited numbers. On both shores of the Persian Gulf, innumerable varieties of dates are grown, which not only almost entirely feed the whole population of those districts, but the picked superior varieties are exported in large quantities to Europe, America, and probably other places. While in Sindh, Bahawulpur, Mooltan, and from Dehra Ghazi Khan up to Bannu, although the true date palm is also grown in unlimited numbers, yet Mr. O'Brien states that, when at Karachi in the date season, he found that the Mooltan and Sindh dates were 'thought nothing of for exportation.' The people of Sindh and Mooltan also feed largely upon this date, and the surplus is exported principally to the

Punjab. Many of the Arabian varieties of dates are, however, far superior to those which Mr. O'Brien sent me from Mooltan. As a food material, the Mooltan date is certainly most valuable, but for exportation, in competition with the superior varieties of Gulf dates, it appears to be 'thought nothing of.'

The climate and soil of Mooltan and Sindh appear to be perfectly suited to the date palm, so much so, that Mr. O'Brien says, that even on 'reh' (oosur) soil, where nothing else will grow, it appears to luxuriate. The reason for the inferiority of the Sindh date is, I think, not far to seek. Reading over the memoranda on the cultivation of the date palm in the Persian Gulf and in Mooltan, it will be seen that the Arabs, having got hold of some fine varieties of date palms, which came either by natural or artificial selection, perfected their fruit by *very careful* and patient cultivation, by means of manure, irrigation, artificial fertilization, thinning of the surplus fruit, &c. While in Mooltan, although the same palm grows in literally hundreds of thousands everywhere, it is allowed to grow *spontaneously* from seed, and no attempt is apparently made to improve it by cultivation, or propagate the best kinds by means of offsets, as in Arabia; and nowhere does artificial fertilization seem to be practised.

It is strange that although this tree has been located in Sindh and the adjacent countries from time immemorial, no mode of cultivating it has grown up. This fact may possibly militate against the theory of the date palm having been introduced into Sindh by the Arab conquerors of Mooltan, as stated in Mr. O'Brien's letter; unless it be that, in those days, even the Arabs

had not yet begun to cultivate and devote attention to their date plantations.

It has been stated in one of the Memos. from the Persian Gulf, that the Arabs have a notion that, when *seed* is sown, the majority of palms turn out *males*. This is not improbable. When fertilization is left to nature,—that is, to the agency of the wind and insects,—male trees would require to be in *excess* of the females, otherwise a sufficient amount of pollen might not reach the female flowers, and in such abundance as to *fully* and *potently* fertilize them, and thus enable the trees resulting from their seed to germinate in large numbers, grow vigorously, and compete advantageously with thousands of other wild plants. This may, therefore, be the reason why in Mooltan no need has been felt for artificial fertilization. There, the palms grow spontaneously from seed; the males are probably equal in number to if not more numerous than, the females, and interspersed among them. Insects and the wind, therefore, could hardly miss bringing the pollen in contact with the female flowers, and impregnate them.

Just consider now how much more economical, as far as land is concerned, is the Arabian method of dealing with the date palm. A plantation of 200 palms is made from *female* offsets only. Before they begin to flower, the male trees are not wanted at all. When the female trees reach their adult age, the flowers of three or four male palms, by means of artificial fertilization, would probably be ample to impregnate the flowers of the whole plantation. The interesting part of this process is, that the male trees need not even be within *miles* of the female

plantation, so much so, that when male trees are insufficient in one district, the Arabs import male flowers from another district. Each palm tree requires at least a space of 12 feet across, in all directions, or a ground surface of 144 square feet. Sometimes more is given. It will, therefore, be readily seen how much space is economized by the Arabian mode of cultivation, that is, by planting *only female trees* and practising artificial fertilization. Another advantage of planting offsets is that, it is said, they come to a flowering age sooner than seedlings. This is, I think, highly probable; it is so with other plants. Whether you plant cuttings or offsets, or whether you bud or graft, the resulting plants will flower earlier than if they were *seedlings;* moreover, the sex of palm offsets is known before they are planted, while it is quite impossible to tell before flowering time,—that is, before the seedling attains the age of from 6 to 12 years,—of what sex it will turn out.

As Sindh, Mooltan, and the adjacent countries appear to be favorable for growing the true date palm (Phœnix dactylifera), there appears to be no good reason why the superior Gulf varieties of date palms should be any longer excluded from those districts. They might be easily introduced, *viâ* Karachi, by means of offsets. This is the only way of acquiring any *desired* variety. There are in Sindh already immense numbers of inferior kinds, which have raised themselves from seed. It is only the choice kinds that are needed. A new trade in offsets would also benefit the date cultivators of the Gulf.

Now, when offsets are not needed for making new plantations, the Arabs remove them, and throw them away, or use them for fuel. Leaving them would act

as a drag on the parent tree, and prevent it from growing vigorously and fruiting early. They would, therefore, probably be too glad to find a market for them in Karachi and other places. These superior dates are such fine things, and so much worth having, both for the local and foreign trade of their fruit, that it is a wonder to me their introduction into Sindh has not been thought of before. If this importation of date offsets were commenced now, in fifty years a large portion of Sindh might become covered with the finest date palms in the world, and a trade in dates be set up in Karachi, which might rival that of the Gulf. There appears to me no sufficient reason why, all along the banks of the Indus, there should not be plantations of the superior date palms, irrigable, when necessary, from the river, and carefully cultivated and fertilized, as in the Gulf.

CHAPTER IX.

ADVANTAGES OF LARGELY EXTENDING THE CULTIVATION OF THE DATE PALM IN INDIA.

LEAVING out of consideration for the moment any advantage to be derived from the local or foreign trade in dates, this palm tree appears to me especially suited to the drier parts of the Indian Peninsula. Moreover, I think, it is the *one* tree which promises *most* in the periodical famine times to which India is subject. Much money and labour have been, I believe, expended, and many kinds of trees have been lately introduced by seed, and disseminated, with a view of providing something edible for the natives in times of scarcity. But this one, the Phœnix dactylifera, which promises most, and which is well known to be partial to dry countries, has not, I think, been sufficiently patronized. Mr. Ridley, as I have before stated, informed me that the best crop of dates he had from the Lucknow palms was in 1878, when there was hardly any rain before October. The drier the climate within certain limits the finer the crop. It must not be supposed, however, that in tracts of country subject to the monsoon this palm will not grow. On the contrary, the experience gained in Oudh shows that it thrives, flowers, and fruits well. Wherever the date palm grows,—in Egypt, Northern Africa, Asia Minor, Arabia, Persia

Sindh, &c.,—the people live on almost nothing else. Palgrave, in his Journey through Arabia, calls the date 'the staff of life.' It has been stated, with what truth I don't know, that, during the last Russo-Turkish war, the Turks marched and fought upon little else than dates (I suppose with the addition of coffee as drink). Dates appear to afford an all round sufficient material for the sustenance of the body. In dry climates, in various parts of the world, and in dry seasons, such as when the monsoon fails in the moister parts of India, the date palm would be *at its best.*

From statements made before, and from my own observations, I feel certain that there is no part of the world, suited to the date palm by soil and climate, to which its seeds and offsets could not be transported without losing their vegetative powers. The small woody stump of the offset is like a *bulb.* When placed under proper conditions of soil, warmth, and moisture, it will root and vegetate, and make a new tree, yielding, with proper cultivation, fruit like that of its parent.

In Mooltan and Muscat, the annual rainfall is said to be 7 and 4¼ inches respectively. In both these places (one inland, the other on the sea-board) the date palm fruits abundantly, and the people live largely on dates. In the former place, it grows from seed, without any cultivation whatever. In the latter, it is probably propagated by offsets, as well as by seed, and cultivated carefully, like other fruit trees.

What a blessing it would be to the drier parts of the Indian Peninsula, where rain is either normally scanty, or where the monsoon fails periodically, if this wonderful tree could be grown extensively from seed, so as to

give hundreds of thousands in each district. In ten years or so, there might, with proper management, be myriads of date palms in India, yielding fruit of the most nourishing kind. It might be either eaten at once, or preserved, as in Mooltan and the Persian Gulf, for future use. If not wanted for human food, it makes a first-rate food for cattle.

How it would gladden the hearts of the poor people, when their crops were withering from failure of the monsoon, to turn their eyes to their palms, and see the dates swelling—turning yellow or red—and giving promise of plenty, to keep off starvation from their homes. What a truly magical 'two-stringed bow' that would be to have flourishing crops of 'bajra,' 'jowar,' and maize, in *one* direction, when the rain *does* come; and flourishing crops of dates in *another* direction, when the rain does *not* come. This picture, although apparently fanciful, can undoubtedly be realized. It would, I think, well repay studying. Railways and canals are admirable things to distribute food and water, wherever rain may fail; but to have, in addition to these, hundreds of thousands of fruit trees, which usually *delight in a scanty amount of water*, would be a still more admirable feat.

As stated before, the amount of rainfall in Mooltan is very small. There, the dryness of the air is not even tempered by the sea breeze, as in Muscat. Yet the average weight of fruit per tree, in Mooltan, is put down at two maunds! 160 lbs!

It is easy, therefore, to calculate approximately the weight of dates gathered from 1,000 female trees, and the money value of the land occupied by such a plantation. With the trees 12 feet apart, a piece of land 600

feet long and 240 feet broad would give 50 palms in one direction, and 20 in the other, or 1,000 in all. The Settlement Officer's estimate, at Mooltan, is two maunds per tree. This would give, on such a piece of ground, when the trees were in full bearing, 2,000 maunds of dates; or, at one rupee per tree, would yield Rs. 1,000. Supposing, however, that the date palms were raised from seed, and that half would probably turn out *males*, there would still remain Rs. 500, as the money representative of the above plantation of seedling date trees, even supposing the monsoon not to have yielded more than 7 *inches*. Moreover, nothing of the date tree is wasted, but the main important additional product would be fuel, the material most wanted in India next to food. Wherever it may grow in plenty, the cultivator has little need to burn his cowdung. Add that from the time of planting till almost full-bearing—say 10 years—the intermediate space of ground might, with benefit to the palms, be cropped with wheat, barley, gram, or any other low crop in the winter; and with either 'moong,' 'mothee,' 'oord,' or such like, in the rains. Near cities, vegetables of sorts might also be grown. Of course, all these calculations must depend on a certain amount of methodical care being given to the date palms. Further on, I shall indicate the minimum amount of cultivation I should consider necessary till the trees begin to bear; and afterwards, to keep them up to the proper bearing standard.

CHAPTER X.

SCHEME FOR CARRYING OUT THE PROJECT OF EXTENSIVE DATE PLANTATIONS IN INDIA.

THERE are several tracts of territory in India which would, I think, be immensely benefited by having plantations of date palms systematically introduced. All Sindh and the adjoining territories, all Rajputana, that tract of territory comprising the province of Mysore, the Southern Mahratta country of Bombay, a large portion of the ceded districts of Madras,—all these are said to receive very little rain, or, to speak more accurately, they get an uncertain annual amount of rain.

It might perhaps be said—it is all very well to have the advantages of introducing the date palm extensively into these tracts of country as an alternative against the failure of crops ; but what one would like to know is, *how* this is to be done in order to *ensure success*, and sufficiently cheaply, so as to make it *practicable*. I shall endeavour, therefore, to sketch a plan of invasion which, I think, would afford reasonable hope of success. Cheapness, however, is always relative to the object and value attained.

In planning railways or canals, Government set up an organized establishment to carry out their schemes. The same has been done with regard to vaccination. No less necessary, I think, will an organized establishment be to invade successfully the before-mentioned

tracts of country with myriads of date palms. The scheme is either an important one, or it is not. If it is, it is worth doing well and thoroughly. Nothing should be left to chance, otherwise the attempt might be only a waste of labor and money. My experience is, that it is of little use relying on any active assistance from District Officers or other heads of districts. As I said before, they have already too many things to think of, and their hands and heads are therefore full of their own work.

It is true there is a good number of date trees alive in the districts of Oudh, but, considering the amount of seed distributed, there ought now, in some districts, to have been many more. The object is not only to *send* seed, but to have *thriving trees*, so that they may procreate and extend, and serve as a basis for further propagation.

With such experience, I think it would be useless to hope for any real good without a special organization. I shall here, therefore, state briefly what my ideas on the subject are. Famine is too serious an event not to be counteracted systematically by every possible means. Thuggee and dacoity, where only a small number of deaths were concerned, have had their special department. It is, therefore, not unreasonable to hope that a small special department might be set up where *famine* is concerned, and where hundreds of thousands of deaths may possibly occur.

I shall take the tracts of land one after the other and endeavour to sketch out a plan for each :

(1) Sindh.

The date palm grows so readily and abundantly

already in Sindh and the adjacent countries, that it seems a pity, both for the internal and external trade, the choicer kinds from the Persian Gulf should not be introduced. In Sindh the date palm grows everywhere spontaneously from seed. But it appears to undergo no cultivation whatever. It fruits abundantly, and produces a very nice small date. Sindh, I should say, is thus sufficiently protected against failure of ordinary crops. But the introduction and proper cultivation of the choicer kinds is so easy, where the plant is already well known, that it would benefit the people and the state to extend the growth to the more valuable kinds, by importing offsets from the Persian Gulf close by. Offsets of the best kinds of date palms might be imported through Karachi, literally in shiploads.

To organize and supervise the whole department, and to inspect all the plantations and see that, when once started, the palms are not neglected, a special officer would be required, with two assistants *from the Persian Gulf*, who know all about the cultivation of the date tree and the curing of its fruit.

This new cultivation should be begun at the principal stations, and be pushed from these centres further into the country. Seeds of the best Gulf kinds might be also introduced to improve the local breed. The only further assistance that would be required for many years, is a local cultivator in charge of each plantation, and some cheap establishment to prepare the ground, manure, water, and tend the trees for the first 5 to 10 years. As in Sindh the date palm grows already, there would not, I think, be much fear that, after the offsets

and seedlings had established themselves and were growing satisfactorily, they would not, with ordinary care, continue to flourish, especially if once the people had seen how superior the Gulf kinds are to the Sindh dates, so that plantations once started in one direction, the same establishment could set to work in another direction. Of course the Gulf mode of cultivation would have to be introduced, which not only economizes land, by having females only in a plantation, but produces the best dates in the world. Within a very measurable period of time, if this scheme were set on foot, Karachi and Sindh might rival the Persian Gulf in its exports of choice dates.

(2) Rajputana.

The only part of this country which I have seen, is from Agra to Jeypore, and thence to Ajmere. There may be deserts proper in Rajputana, such I am told exist towards Bikanir, but certainly all the tract of country above-mentioned is anything but desert. Everywhere I saw 'moonj' grass; in many places also 'babool' trees. Here and there, at long distances, there were crops of 'jowar or bajra,' 2 or 3 feet high, it is true, instead of 8 or 10 feet, but there they were. Villages are very scarce, although a railway official, travelling in the same carriage as I was, told me, all along the line water could be had at 30 feet. This depth of water seems child's play, compared to what it is in the Agra and Etawah districts—*viz.*, 60 and 70 feet from the surface. It would appear that the only real drawback all along the Rajputana-Malwa Railway is *want of population.* This tract of country I consider *eminently* suited to the date palm. In course of time, I

am of opinion that this tree might be the making of Rajputana. It is one of the few trees that could support people with little effort on their part, and pave the way to the introduction of other and more varied crops. The following is what I should propose: One Government Officer, for the whole of Rajputana, would be required as organizer and inspector of date palm plantations. He should have one native assistant for *each* of the Rajputana States. The chiefs of the states would probably co-operate willingly when they understood the benefit to be derived from this scheme. As to this plan of operations, I would start plantations of *seedling* date palms in every centre of population first, then I would push the date palm in all directions into the uninhabited tracts. The seeds might be got in *any* quantity, of the best kinds, from the Persian Gulf. Later on they can be also had in considerable quantities from Lucknow. But from Mooltan, Sindh, and Bahawalpur, seeds of the best kinds of those localities could be had in unlimited quantities. I said seeds, because seedlings are probably more vigorous, and would require less care, than the offsets; but there would be no harm whatever in setting up a small plantation of *female* offsets, of the choicer kinds, at the head-quarters of every state. These would require the *personal* attention of the assistant in each state. As the date palm already grows largely in Bahawalpur, on the N. W. border of Rajputana, there can be no difficulty in introducing it also into Bikanir, Jessulmir and other places bordering the desert proper. Every separate plantation would require a small establishment of natives to water, manure and generally tend

the trees. If this scheme were undertaken with spirit and carried on vigorously, until the people of the country began to understand the great value of the date palm, date cultivation, I feel certain, would afterwards go on of itself. The Government agency and direction would only be needed temporarily, say for 10 to 15 years; after that it might be entrusted to native agency alone. But to start the scheme, Government must take the initiative. If this scheme were adopted and properly organized, I should say, in 50 years from the time of commencing operations, Rajputana would not be recognized. As a help all along the State Railway, each station might also become a centre of propagation.

Let us consider for a moment how this scheme, if started, would act in Rajputana. From each centre of population, the date palm would be pushed into the surrounding uninhabited country. Wherever means of livelihood are possible, villages and cattle will follow, manure will accumulate, wells will be sunk, and other trees and other crops will become possible. Incidentally I might mention that the other tree which appears also eminently suited to Rajputana is the 'babool' (Acacia arabica). It grows there already in small quantity. It is wanted, however, in *immense forests* to supply bark, for tanning purposes and for fuel, to save cow manure. At the Cawnpore tannery, I was told that 'babool' bark was richer in tan than *oak* bark, and, in addition to myrobalans, was the only tan used there. The 'babool' and the date palm might be the means of regenerating three-fourths of Rajputana. Camel or even horse breeding might flourish in that dry country,

if *people* were there to see to it. The Ajmere basin I thought was particularly inviting to the date palm. Here it would act in two ways: (*1st*) by feeding the people; (*2nd*) by sucking up the subsoil water from the basin, which receives the drainage from the surrounding hills, and creates that malaria of which the residents of Ajmere complain.

What fine pictures the Mayo College and the surrounding stone buildings would make, if they were framed in groves of date palms!

In the *Pioneer* of 23rd March 1885, page 2, in an article on Western Rajputana, the following occurs: "Jessulmir and the region south of it, in the cold and hot weather, is a dreary-looking region, with sandy undulations, stunted ragged trees, brackish water, and frequent famines. In the ordinary rainy season, good grasses grow, and are abundant, and ample crops are raised. The ground allows of the formation of small tanks, which afford a continuous supply of water to men and cattle during the three months within which a 'bajra' crop can be raised, so rendering cultivation independent of wells. In some places, wheat can be grown. Sometimes onions, tobacco, red pepper, and radishes are raised in small quantities. Fifty miles N. W. of Patodi is Pokaran, a town of 12,000 inhabitants. It is situated in a stretch of country comparatively flat and hard, and abounding in spots, where water collects. From some high ground north of the town a really pleasing view is obtained. To the right front are the trees and buildings of Pokaran, and to the left front, a broad expanse of water, which, until near the hot weather, is fresh. In Marwar and Bikanir, the

villages of the Bishnois are numerous. They are excellent cultivators and very intelligent. A S. W. course of ninety miles brings us to Balmeer, the chief town of Mallani, a tract of country about 8,000 square miles in extent on the Sindh border, with the bed of the Luni river running through its southern part."

Here then is a promising home for the date palm. It would appear criminal not to make an attempt to introduce it into a country so promising, and where it is so much wanted. As the writer of the above does not mention the date palm in his travels, it appears absent from those tracts, although in Bahawalpur, on the western border of Rajputana, it is to be found. Courage should be taken from Muscat and Mooltan, where good dates are largely grown. The average rainfall between 1879 and 1884 was 4¼ inches in the former date-country, and the average of 21 years was 7¼ inches in the latter. The people of Rajputana would soon learn to interest themselves in a tree which not only promised good and nourishing fruit in abundance, but also gave them fuel and materials for thatching, and timber for housing themselves, besides materials for mats, bags and baskets. If the scheme were placed fairly before the chiefs of the Rajputana states, they could hardly be so unwise as not to co-operate willingly. All that appears necessary is an organization like that of the Vaccination Department, to work persistently at this *one* object for 15 or 20 years, and the thing would be done.

This is all I have to say of Rajputana. I shall now turn to

(3) That tract of territory comprising the province of Mysore, the South Mahratta country of Bombay, and

a portion of the ceded districts of Madras, where rainfall is precarious.

For Mysore alone, I would suggest a special Government organizer and inspector, with seedling plantations in the vicinity of all the towns. In Bangalore, besides seedling plantations, offsets of the best kinds might be planted. Having seen what trees can grow in Bangalore, I have no hesitation in stating, that it offers great promise of success to the introduction of the date palm. Moreover, Mr. Cameron, Superintendent of the Government Garden at Bangalore, informs me that the Phœnix sylvestris, of which the Phœnix dactylifera is only a variety, is the Mysore toddy-palm. It is to be regretted that the experiment made with offsets in Bangalore, in 1871, came to nothing. It is not at all surprising,—they were planted in a dry exposed field, neglected, and probably not watered. It may have been nobody's business to look after them.

With a similar treatment, *even in the Persian Gulf*, offsets would meet a similar fate—they would die.

An offset is a bud without roots, until it does root and establish itself thoroughly; it requires not only care, but skill, in keeping up its vitality, until it is able to shift for itself. On the contrary, a seed when it begins to germinate, or even before, provides itself with a root, which goes down to a good depth. Perhaps it grows more slowly, but also more surely, than the offset. It is enough to read over the memos. from the Persian Gulf about date cultivation, to see how much care the Arab gives to his date offsets. For two or three years, his attention to them is unceasing. Whenever, therefore, sufficient supervision and skill cannot be afforded to offset plantations, I would recommend *seedling* plantations only being started.

For all the other parts of the tract of territory mentioned where little rain falls, I would suggest another Government organizer and inspector of date plantations, and I would proceed in the same way from the principal cities and towns, and push the cultivation of the date tree into the interior. All over these tracts, the Phœnix sylvestris grows freely and is used for toddy. In course of time, crosses between the two varieties might be effected, which might create unexpectedly vigorous and new races of date palms.

(4) I have now only to mention H. H. the Nizam's territories. These also appeared to me especially suited to the date palm. It is true there are many stones in those dominions, but it is marvellous how fertile that granite soil is where it can be irrigated. Anything appears to grow in it. A great deal of rice is grown in the Hyderabad and Secunderabad districts, but the date is infinitely superior in nourishing powers to rice; and the date *tree* is in every way more useful than the rice *straw*. All about that district, I saw the Phœnix sylvestris, which there also appears to be used for toddy. All along the Dhond and Manmar State Railway, I saw immense tracts of country like prairies, with nothing but grass. No trees, no villages, except a few at very long intervals, and I saw only about a dozen heads of cattle along that line. I do not know how far the country along this line would be suited to date palms. I was told there was not much soil, and that water was difficult to get at. This I know that, at one of the railway stations, Chitali, I saw pomegranate, orange, guava, and the mulberry growing more luxuriantly than I have seen them in any other

part of India. A few experiments with seedling date palms in the vicinity of the railway stations, so that they might easily get water, might tell a fine tale. Some trees are able to send their roots into the fissures of rocks, and defy the shallowness of the soil and the dryness of the climate. If the date palm and the Mediterranean prickly pear—a tree *very partial to rocky soils*—could be acclimatized along the Dhond and Manmar Railway, so as to create food, and thus attract people, there might yet be untold wealth in that apparently barren piece of country. I have a suspicion that it might be found suited to all the Mediterranean fruit trees, vines, oranges, mulberries for silkworms, and such like. In Sicily and Malta, many of these trees grow on rocky soil, and delight in it. This tract of country, with its grass prairies, would appear also suited to breeding mules, if it were populated. What finer breed of ponies is there than the compact, hardy 'Deccan poney'! It would probably be unmatched for mounted riflemen.

With regard to H. H. the Nizam's territories I have only to repeat what I said about Mysore,—*viz.*, that there should be one organizer and inspector, with three or four native assistants under him, with cheap establishments, to look after the plantations. Most of these should, I think, be of seedlings, but perhaps at Hyderabad and Aurungabad, offset plantations might, with proper supervision, be also tried. With so much Arab blood in these territories, it is surprizing that the introduction of the choicer kinds of date palms has not been thought of. You see cocoanuts, palmyra trees, 'khajoor' trees and other trees, but I don't remember having seen *one true date tree*, either in Hyderabad, Secunderabad,

Gulbhurga, or anywhere between Raichore, Ahmednuggur and Manmar.

Further on (Appendix E) I have given a table of rainfall kindly furnished by the Meteorological Reporter to Government, N. W. Provinces and Oudh. It is an average of many years of observation. It will be seen that, at Lucknow, where the date palm has flourished satisfactorily, the rainfall is 36 inches; at Bangalore it is 35 inches; in Hyderabad, 30 inches; in Jeypore, 23 inches; in Ajmere, 22 inches; in Mooltan, where the date tree grows 'literally in hundreds of thousands,' the rainfall is 7¼ inches; and in Muscat, at the entrance of the Persian Gulf, which is a place famous for dates, the rainfall is said to be only 4¼ inches.

Here we have the date palm flourishing under the extremes of rainfall of 4¼ and 7¼ inches in Muscat and Mooltan, and of 36 inches in Lucknow. The date palm does not at all dislike excess of rain or watering, provided there be good drainage at its roots. At the ripening time, however, the drier the climate and the less the rain, the finer is the crop. I know of no other food tree which is so accommodating: To live, flourish, and fruit with abundant rain, and to fruit better with a scanty supply of rain, indicate a constitution which render it invaluable in a country like India, subject, as it is, not only to *annual* periods of wet and drought, but also to cycles of *prolonged* drought and danger of famine. Such being the extremes in which the date palm will flourish, there is no need to say that, in the intermediate places of Bangalore, Hyderabad, Jeypore, Ajmere and the rest of Rajputana, the date palm will likely be *quite at home*, and prove of immense value.

CHAPTER XI.

RULES FOR THE CULTIVATION OF THE DATE PALM IN INDIA.

NOW taking into consideration all the information I have been able to collect regarding the cultivation and propagation of the date palm in various countries, as also my own experience of this tree, I shall endeavour to place before the reader some rules for the guidance of any one desiring to take up the cultivation of the date palm in India.* These rules will, of course, be subject to any alterations which further experience may hereafter indicate.

Propagation by Offsets.

Where these can be had in quantity, from *female* trees of good kinds, it is more economical to form plantations from offsets, and, in the flowering time, practice artificial fertilization. The reason is evident. All the space of ground under cultivation is occupied by *fruit-bearing* trees, while a small number of males, which produce only the pollen, can be grown anywhere in the vicinity.

The offsets (in the vernacular 'kallà') usually grow at the foot of the main stem, but sometimes on it. They are fit to detach from the parent tree when they have

* Australia or elsewhere.

about a foot of woody stem or stump. They should be not less than three seers in weight. If the parent plants are growing vigorously, and under favourable conditions, the offsets will attain a size fit for detaching and transplanting probably in from four to six years.

In the Persian Gulf the offsets are planted at once, where they are to remain, 12 or 15 feet apart. But then the Arab knows what he is about, and fully appreciates the value of his date palms. He plants a grove of from 80 to 200; waters them *daily* till they strike root, and sees that no dirt or earth gets into the crown of leaves. In India I should prefer planting offsets in September or October, on the east side of some trees, so as to get their shade during the hottest part of the day. In the first instance, they should be planted in a *nursery*, in properly prepared soil, 3 or 4 feet apart, so that they may be more easily looked after and watered *regularly*, till they strike root and begin to grow. While in the nursery, a few inches *only* of dry leaves should be spread over the soil of the nursery to keep the soil moist and warm. In the next rains, then, all the most forward palms can be taken up, each with a ball of earth, so as not to injure the roots, and planted in their permanent places. Those that are backward in rooting can be left in the nursery till the next September. On the ground chosen for the permanent plantation (which, by the way, should not be subject to inundation, either from rivers or otherwise), holes should be dug from 12 to 15 feet apart. They should not be less than 2 feet wide and 2 feet deep, but the larger they are the better. Half the earth taken out should be returned, mixed with any available rotten manure

some well rotted leaves and some ashes from any 'choolha,' or fireplace. These materials and the earth should be well-mixed together, and the holes filled with them. This loose earth should then be well watered to consolidate it, and prevent the plants from sinking when irrigated for the first time. Then each offset, carefully taken up with a ball of earth, should be planted in a hole in such a way as to leave the neck of the offset on a level with the general ground. A skinful of water should then be immediately given to each. The remaining earth should be made into a 'thala,' or bed round the tree, 3 or 4 feet in diameter, and watered *regularly*. A few inches of dry leaves all over the surface of the 'thala' will economize water, and keep the soil moist and warm in winter, and moist and cool in summer. The best sight for a plantation is high ground, which can be irrigated, when necessary, either from canal or well. For several years after planting, in the spaces between the palms, any low crops, such as wheat, barley, or gram in winter, 'mothee,' 'moong,' or 'oord' in the rains, can be grown. Tall crops would be injurious. As the trees grow, they should be treated exactly as other fruit trees are treated from which good and abundant fruit is expected. Every January any available old manure and rotten leaves might be spread over the 'thalas,' and stirred into the earth round the palm. After the first years, as the tree grows, the 'thala' should be enlarged up to 3 or 4 feet all round, until they begin to flower (which, if properly cared for, will occur in about five or six years, and if badly cared for, in ten or twelve years). They will require no further care than a *full* watering once a month or so

during the hot dry months, and a top-dressing of manure every year. Then, whether the cultivator thinks of them or not, they will go on growing, with a promise of plenty in due course, and with the hope of their descending to his great-great-grandchildren — always growing, and always laden at the proper season with delicious dates. It is not advisable to plant other kinds of trees in the palm grove, as their roots and shade would interfere with the growth of the date trees. While the trees are growing, however, as I said, *low* crops can be taken between them with advantage. Finally, never lose sight of the well ascertained fact that '*fine* fruit can only be had by *good* cultivation.' It has been abundantly proved that manure improves the size and flavor of fruit and increases their sweetness. I must here impress upon you that, while the offsets are in the nursery, and for the first years after planting out, they will require somebody's *especial* care, more so as regards water in the hot weather and winter. Afterwards very little care beyond that mentioned will be needed. In making a plantation, if space were no object, *male* offsets might also be planted. In the centre of every four females, one male might be put. This would, however, require almost double the space, as the plantation would then be in alternate lines of male and female palms. In such a plantation, no artificial fertilization would be needed, as males and females being regularly intermixed, insects and the wind would do it all.

Propagation by Seed.

This requires different management. As has been stated, in Arabia, they do not usually propagate palms

by seed.* Having already many fine kinds, they find it more economical and profitable to fill a plantation with offsets from their best female trees. Darwinianly speaking, however, perpetual propagation by buds, offsets or cuttings only is said to lead probably, in course of ages, to mischief, by weakening the constitution of the plant. I do not believe that this has been yet satisfactorily proved. Tea, coffee, poppy, and other plants are subject to disease, although propagated only by seed. But it is well, I think, to have new blood introduced by seed. Through it, varieties are likely to turn up, which may be perfectly suited to the locality and its surroundings, and which might, therefore, be considered indigenous. I would advise plantations by offsets and by seed to go hand in hand, offsets being taken again from the best seedling females, and so on.

The best and plumpest seeds of the largest, best flavored, and most desirable varieties should be selected. Time will show which are the kinds best suited to any particular district. The seeds should be sown as soon after ripening as possible,—that is, in September and October,—in properly prepared beds, enriched with old manure and rotted leaves, and an inch or more under the surface. The sowing should be done a few days after irrigating the prepared beds and when the soil is workable, so that there may be no necessity to irrigate immediately after sowing the seed. The seeds should be sown from 6 to 12 inches apart. Afterwards the beds should be irrigated as often as need be. After

* Although one of their kinds is called 'khudràwee,' which means 'self-sown,' that is, grown spontaneously from seed.

germination, the intermediate spaces might, if necessary, be used for any small annual plants, without harm to the date seedlings. They should remain in the nursery till next September, and in order to economize water during the hot weather, spread an inch or two *only* of small dry leaves, such as 'Neem' or 'Sheeshum,' over the surface of the beds. When these turn black and crumple up by carbonization, renew the shallow layer of leaves. After a year, the young seedlings may be lifted, with a ball of earth to save the roots from injury. If you are a practical gardener and a careful nurseryman, you may plant them out at once, 12 or 15 feet apart, in their permanent plantation (a piece of ground 600 feet × 240 feet will locate 1,000 palms at 12 feet apart). If, however, while the seedlings are so young and scattered over an extensive piece of ground, they are not *very carefully looked after, and watered daily*, or every second day, during the hot winds, many of them are likely to perish. The safer plan would be to replant them 3 feet apart in a second nursery, prepared, as before, in a shady site, giving them due care, by water and surface leafage, for another year. Then they can be finally planted out in their permanent places in the next rains. Whether it be in planting tea, or coffee, or cinchona, or anything else, those are the most successful planters who devote the most care and personal attention to their young trees. It stands to reason—nature does the same. In any forest, the seeds fall. They are kept warm and moist by the surface leafage. They germinate, and their roots penetrate into a lovely decayed leaf-mould, probably disintegrated for them, as Darwin shows, by earth-worms. This is

called 'virgin soil,' and is as 'mother's milk' to them. They are shaded and protected from wind by the parent plants; and when their roots penetrate sufficiently deeply, and their wood becomes strong, they are independent of further nursing, and are able to withstand their inimical surroundings. Coddling afterwards might do them more harm than good. When ready for planting into their permanent places, the seedling date trees should be treated exactly in the way recommended for offsets. A good sized 'thala' should be made round each tree; surface leafage given in the hot weather, and top-dressing of any available old manure in spring, well stirred into the ground, and frequent picking of the surface in the rains, when the soil is workable, and regular watering in the hot weather. As stated before, the intermediate spaces can be utilized for any low crops.

Seedlings are hardier than offsets, but they will take longer to fruit, and the fact that their sex cannot be known till they flower, is a certain disadvantage. The probability of their not requiring artificial fertilization may, however, be taken as a counter-advantage. The dates of offsets will be, under favorable circumstances, like those of the parent. Those of seedlings may be sometimes similar to those of the parents, at other times inferior, and less often *better*.

Whether palms are raised from offsets or seeds, they will, like bulbs, in due course, often give offsets of their own, either at the foot of the stem, or, less frequently, on the stem. Those which do not give offsets will make more rapid and vigorous growth, as the strength of the palm is concentrated in one stem. But as female

offsets are valuable, they should not be removed till the sex of the parent is known, or if removed and planted elsewhere, when of the proper size and weight, some means of identifying them by tickets would be advisable.

The green leaves should, on no account, be removed or tied up. They are the lungs and stomachs of the tree, and its healthy growth depends on them. When the lower whirls turn yellow and decay, they can then be removed and used as fuel, or for other purposes.

Process of fertilization.

As before stated, in Sindh, artificial fertilization is not practised. But the result of the trees being left too much to nature, is not a first class date. Besides, it is a wasteful process, as a large extent of land must be taken up by the pollen-bearing plants, an excess of males over females being probably needed. While the Arab method, with a minimum of males, ensures that each bunch on every tree becomes impregnated. I have also a notion that the more fully, or the more potently, an ovule is fertilized (that is, the more pollen grains reach the pistil), the more vigorously will it grow, and the larger and more perfect will be the pulpy fruit round it. I am aware that fine fruit can be grown without any seed being produced; such as the famous egg-orange, the plantain, 'surkha' mango, pineapple and others, and it is not improbable that if they go on for ever propagating by offsets *only* in the Persian Gulf, they may arrive at a good seedless date. But at present unfertilized or seedless dates "are small, totally insipid, and only fit for goats." In

another place they have been called *acrid*. I suppose by this was meant astringent. In spite of artificial fertilization, however, unless *every flower* is individually impregnated, a certain number will remain pollenless. These seedless dates are called 'shis' in the Persian Gulf, and 'khasi' or 'bogh' in Mooltan.

When both the male and female flowers are mature, some sprays of males are inserted in each female bunch and secured by any bit of string. Then the wind, moving the bunch, shakes out the pollen from the male sprays, and scatters it over the female flowers. Insects creeping about the bunch also carry pollen from the male to the female flowers. In short, what the Arab does, is to convert *diœcious* into *monœcious* bunches ; or, in other words, from different sexes on different trees, he makes both sexes on the same tree, and trusts to wind and insects for the impregnation of the individual flowers.

After fertilization, the Arab stops watering the trees for six or eight weeks, and when the dates begin to swell, leaves *only* from eight to twelve of the most forward and fully fertilized bunches. This is what in Europe would be called 'thinning' the fruit, in order to throw the whole strength of the tree into a smaller number of fruit. The object of all fruit cultivation should be to get a maximum of fine well flavored pulp (where the pulp is the edible part). This is more likely to be obtained by 'thinning' (cæteris paribus) than by leaving the whole crop on.

The date palm flowers in February and March as soon as it feels the commencing warmth of the spring. If fertilized, the young dates, which are at first cream

colored, swell and turn green, and in June and July turn either red or yellow, or shades thereof, according to variety. At first these red or yellow dates are astringent ; then they become sweet with a nutty flavor, and are crisp. In August they begin to turn soft and brown, and are then very sweet. Then they are readily attacked by wasps and other insects. In September and October they become fully ripe. During the ripening period, they require a dry atmosphere to come to perfection.

Besides the varieties of red, yellow, and other shades, in the Persian Gulf they have three distinct divisions of dates :

(1) Those which do not ripen beyond the red or yellow (or kharak) stage. When ripe enough, these are sweet, slightly astringent, nutty and crisp. They are eaten largely in this state (as 'bair' are in India), or are boiled and dried, or otherwise preserved. This class of dates is called 'baraimee.'*

(2) Another division of date palms do not ripen their fruit beyond the sweet, soft, and brown (or 'rutub') stage. These are called 'zàhidee.'*

(3) Lastly, the division which gives the finest and best dates is that which ripens its fruit to a clear amber brown ; is large and full of 'molten syrup.' If allowed to remain on the tree till they become semi-dry by the action of the sun and air, the latter kind are fit for exportation in boxes without any further preparation. They are what are sold in European fruit shops. These

* Later information from the Persian Gulf states, that all dates, of whatever kind, pass through the 'kharak' stage, but some don't go *beyond* it ; that 'rutub' is only the *first stage* of *all those* that form '*khoorma.*'

kinds of dates, when so ripened and dried, are called 'khoorma.'

It is not impossible that a seed taken from one kind and sown will produce another kind of date palm, or *vice versâ*, or a cross between the two, according to the male parent used. And therefore, as the trade in dates between the Persian Gulf and Europe and America increased, the people found it more profitable to propagate by *offsets* those kinds only which the foreign trade demanded.

The ingenuity of man, as the cultivation of the date palm extends, will no doubt invent new methods of fertilizing the female flowers. For instance, the pollen can be collected on sheets of paper and puffed, like a spray, on to the female flowers, by means of a tube, or by means of a specially made elastic puff.

With regard to further cultivation, the rule that holds good for all fruit trees will apply to date palms. They should be watered regularly in the hot dry winds. In the winter they will hardly require any water; and in the rains, they will probably get more than they need. If the monsoon fail, and water be available from wells or rivers, they should have a full watering once a month, with the exception of immediately after fertilization and during ripening time. A month or so before flowering, a top-dressing of good old manure should be given, and during the hot winds, a surface leafage will economize water and keep the soil round each tree moist.

The value of manures for fruit trees has been well exemplified in an article in the *Gardener's Chronicle* of 25th April 1885, p. 535, on the "effect of manures on the growth and quality of fruit." Dr. C. A. Goessmann,

by his experiments, has sufficiently proved that certain mineral ingredients in the manure, or soil, are essential to the production of good fruit. He has shown that manured fruit trees produced better, sweeter, and finer fruit than adjoining unmanured trees. It is also stated that many of the diseases of plants, classed under mildew, blight, &c., can be escaped by proper and sufficient manuring, which furnishes the mineral ingredients necessary for the healthy growth of the tree and production of good fruit and seed.

As to longevity, I doubt whether there are any data by which the length of life of the date palm may be fixed. It lives for generations, and, unless blown down by storms, continues, with proper care, to give its annual load of dates. The advantage of growing the date palm in groves, besides facilities for fertilizing, watering, and tending, is that the trees would support each other and could not be blown down.

Wasps and other insects are more numerous some seasons than others. One year I could not go into my verandah without being surrounded and bothered by the common yellow wasp of India. Next year, there was not one to be seen. What the cause is of their being plentiful one season, and disappearing the next, I do not exactly know. Frosty winters may have something to do with decimating them. It would be well, however, for the cultivator to exercise his ingenuity in counteracting the depredations of wasps, &c., while the number of his fruiting palms is yet small. Experiment and practice will soon teach him the best method of saving his date crop from these robbers. In the Persian Gulf, when they wish to save choice dates, they draw

over each bunch a gunnybag, and tie it round the main stem of the bunch just as ripening commences. But during the rains in India, probably some other arrangement than a gunnybag will be needed. The native of India is, however, not very particular as to the fine qualities of fruit, considering that he collects most of what he has already when still *under-ripe*, so that if he cannot somehow 'dodge' the wasps and other pests, his alternative is to eat his dates in the 'kharak,' or *crisp*, sweet, and nutty stage. He can either eat them then, or boil and dry them and keep them like the Panjgur 'chohara,' brought down by Cabul merchants, and the Mooltan 'bhugrian' dates, or the 'kharak pokhta' of the Persian Gulf, till he can consume them at leisure. It should not be forgotten that *all* kinds of dates, whether the 'baraimee' or the 'zàhidee,' or those which ripen further into the 'khoorma' stage, *pass through this 'kharak'* period,—that is, the red or yellow stage.

Wherever dates grow, the people begin to consume them as soon as they get to this 'kharak' stage, and sometimes before. And the people of India will not be behindhand in finding out that a crisp, sweet and nutty date is after all good to eat, and probably much better than many a fruit which they were in the habit of eating before.

There is no good reason why every patriotic native gentleman, whether Hindoo or Mahomedan, should not, if he can afford it, plant one or more date palm groves near his villages, which might become centres of dissemination, and also centres for teaching the villagers the use of this invaluable tree. I have shown that, in Mooltan, profit is made out of date trees. If patriotism,

therefore, be not a sufficient inducement, the desire for profit probably may be so.

I do not, however, hope that, because a measure may be very desirable, anything will be done in India, unless Government take it up. To leave such an important measure to be dealt with by private individuals without Government direction, supervision and urging would, I think, be to condemn it to certain failure. Every plantation started will require, for at least the first three or four years, the personal supervision of some one whose interest it is to *make it* succeed. Lacs of rupees are spent on famine protection works and on famine relief works. The date palm, if introduced extensively, would, say in fifteen years, become a *famine defying tree.* Any money from famine funds spent on this invaluable tree would, therefore, in my opinion, *be very well spent*, and would, in due course, be returned with interest. By that time the natives of India will have learnt that the date palm, as a stand-by in times of starvation, is far more important than the mango tree. It would be to the Hindoos what the cow was to their ancestors. As to Mahomedans, they should always remember that the date palm was revered and cared for by Mahomed, by the Caliphs and their successors.

Finally, a great additional impulse would be given to such a scheme, if approved of by Government, if the fine qualities of the date palm, its mode of cultivation and propagation, &c., &c., were taught to natives in their schools. They always have great faith in anything "jo kitab men likha hai."

I would now conclude this chapter by again reminding the reader with how *little* average rainfall this

wonderful tree will feed the people. In Muscat, the average rainfall is 4¼ inches per annum. There the atmosphere is probably tempered by the sea air. The date palm all but feeds the people of Muscat. In the Mooltan district, the average rainfall is 7¼ inches per annum. There the date palm *grows spontaneously* by hundreds of thousands, and not only half feeds the people annually, and gives a revenue to Government of Rs. 12,084, although there are many exemptions, but leaves a balance for exportation to the Punjab. In Lucknow, although it flourishes with an annual rainfall of 36 inches, it gave the best crop when *almost no rain fell before October.* When it has been proved that this tree loves a desert climate, that it flourishes also in a damp climate, and that when this damp climate puts on a desert atmosphere, for want of the monsoon, the date palm remembers that "now is the time to exert itself," and gives its best crop, no further recommendation is, I think, needed.

For curing and preserving dates at all stages, I refer the reader to the admirable Memo. from the Persian Gulf by the Assistant Political Resident, A. R. Hakim Khan Bahadur.

CHAPTER XII.

CONCLUSION.

WHAT I contend for regarding this useful tree are the following points :

(1.) That it is pre-eminently suited to tracts of country in India which *normally* have a small rainfall, and therefore cannot be readily populated without some tree, which is fitted by nature to yield nourishing fruit in dry countries, such as this tree is.

(2.) That it is also very suited to tracts of country in India which sometimes get good rains and sometimes very bad rains, and I think the date tree is supremely fitted for such places, for two reasons—

(*a.*) Unlike many trees, it stands the rains well, and flourishes both with moisture at its roots and surrounding its leaves in the atmosphere. There are not many trees belonging to a dry climate which will stand a hot damp atmosphere without damping off. Even if it did not fruit in seasons of plentiful rains, it would not matter, as other crops would be abundant. It nevertheless does fruit, and although *then* its fruit may not be equal to the 'crack' dates of regular date countries, it is fit for food, and picked at a stage *before ripening*, it is nourishing, and by cooking and drying, it can be kept for several months.

(*b.*) When, however, rain fails, either totally or partially, the fine qualities of this tree, for countries subject to famine, are marked, as then it feels itself in the climate of regular date countries, and produces a fine and plentiful crop,—that is, it fruits best, exactly when its fruit is most wanted. As a tree to supply an alternative crop of food for dry seasons, I do not know any other which approaches it.

(3.) That in Sindh and adjoining countries, where an inferior, although most useful, date is already grown in hundreds of thousands, there is great room for the cultivation of the *finer* varieties of Persian Gulf dates. The introduction of the finer kinds into a country naturally so suited to the date tree must, in my opinion, eventually lead to a large export trade of choice dates.

(4.) That when fairly established, the date tree will grow and fruit with comparatively less labor and attention than any other fruit tree. Its fruit being dry, with its components concentrated, is, weight for weight, more nourishing than fruits which are more juicy, and therefore contain more *water*.

(5.) That, in addition to all the foregoing advantages, wherever the date palm is abundantly grown, there is no need of other fire wood, as the annual decay of the lower whirl of woody leaves will give an ample and cheap supply of fuel. And if there is one other thing besides food, which is sadly wanted in many parts of India, it is fuel, to save cow-droppings, the proper function of which is manure for the fields. The stems of old date trees also furnish useful timber for dry places. I have seen a long stem of the wild date used, *in one*

piece, for supporting the heavy thatch of two rooms, and the person who built them told me the outer shell of the stem was so hard and flinty that it notches the 'bassúla,' or adze, used to face the beam. It is also well known that the Arabs use the palm-stems largely in their buildings.

Finally, taking the date palm all in all, I do not think there is a more desirable tree for the tracts of country I have previously mentioned, and which are subject, more or less, to periodical droughts.

Appendix.

A.

Colonel Sir Oliver St. John, writing from Sialkote in the *Pioneer* of 9th April, 1885, says—"That there are no date-palms in Afghanistan, at least none that bear fruit. The limit of the food-producing date-palm in Western Asia seems to be the southern skirt of the Helmund and Kirman, or Lut deserts, and thence along the water, parting between the central plateau of Iran and the Persian Gulf, to the Tigris Valley. The limit of altitude at which the date ripens freely varies from 4,000 feet in Beluchistan, to 2,500 in Western Persia, although it can stand a certain amount of frost and snow with impunity; a certain, not very low, temperature is fatal to the date-palm. I saw thousands killed by frost at Magas, in Persian Beluchistan, 4,000 feet above the sea, after the very cold winter of 1871-72. The date-palm, no doubt, grows freely all over the lower valley of the Helmund, and here and there in the central desert of Persia. The best dates in Beluchistan are grown about Panjgur, whence the prepared fruit is exported to India by Afghan traders, under the name of 'chohara.'"

B.

The regions where the date-palm is now found in abundance are, besides both sides of the Indus in India, Persia, Arabia, Syria, Egypt, and all along the north of Africa, and Murcia in Spain. In Arabia, it appears to have been a familiar fruit tree long before the time of Mahomet. It

seems to have followed the Arabs into all the countries which they conquered and colonized; and it is not impossible that without it the Arabs would not have been able to do so much as they have done.

C.

Recently, that is some time near October 1884, in one of the numbers of the "Bulletin Mensuel de la Société Nationale d'acclimatation de France," a list of date palms cultivated in the oases south of Algeria was published: 130 varieties are there enumerated, each with a distinct name. There also they distinguish the date palms into two great classes. One class produces dates which will keep for a year, and another class, the fruit of which must be eaten at once, as it will not keep.

The colors of the dates vary very much—some are red or yellow, as in the Persian Gulf; there are white, black and green ones; others are variegated, with combinations of these colors.

Some are soft, and often full of syrup; others are hard and dry.

With regard to flavor, some are very sweet; some are delicious, and most of the varieties are good to eat. A few kinds are bad, and only fit for animals. One kind is slightly subacid, and has the flavor of camel's milk.

As to shape, they vary also. Some are like fingers, others round. Some like pigeon's egg, others are slender or stout. One kind is shaped like cat's claws, another like the seeds of the carob. Some are late, and others early.

Finally, there are some kinds which never fruit. The reason of this is not given. Possibly these have defective sexual organs.

The following are some of the most prominent varieties:—

No. 6. *El Kattar.*—Middle-sized palm, with prominent nodes.

The date is brown, very sweet, and full of juice, which drops like honey.

No. 9. *Es Souhoub.*—Tall palm with abundant foliage. The date is white, and much esteemed.

No. 10. *Tadala.*—Rather dwarf palm, with a dry, white date. It is much liked by the Arabs.

No. 12. *El Itima.*—Middle-sized palm, with a date of the 'café au lait' color; large and very good.

No. 14. *Khoussa el Atrous.*—Very stout palm; middle-sized, with an olive green, and very large date; very good.

No. 17. *Bazoul el Khadeur.*—Stout and tall palm, with a white, long, and sub-acid date. It flavors of camel's milk.

No. 38. *El Trifia.*—Slender and middling palm, with a green date. It is bad, and given to animals. It won't keep.

No. 41. *Ratbet el teben.*—Tall and thick palm, with a long red date; very good. It ripens after being gathered, by placing it among straw.

No. 49. *Defar el Kat.*—Low and stout palm, with a white, long and dry date, shaped like the claw of a cat.

No. 60. *El Megrounat.*—Tall and thick palm, with a dry yellow date. Ripens last of all.

No. 70. *El Khassassa.*—Small and slender palm, with a stout, green and dry date. It is bad, and is given to animals. It sticks in man's throat, and makes him cough.

No. 90. *El Attacha.*—Tall and stout palm, with a round, yellow and dry date. It makes one thirsty.

No. 97. *Beid Hemmam.*—Dwarf palm, with a soft and white date, like pigeon's eggs.

No. 105. *Nakhelet el Left.*—Middle-sized palm, with a slender, yellow soft date. Ripens very late, and is much used in the 'Cuisine Arabe.'

No. 121. *Sehem el Agherab.*—Tall and stout palm, with a large and stout date. It is green and red, and much liked by crows.

D.

The following are some statistics of the date trade in the Persian Gulf, kindly sent to me by A. R. Hakim Khan Bahadur, Assistant to the Political Resident. He says :

"It is extremely difficult to ascertain with accuracy the quantity of dates exported from the various districts, as the customs are farmed under contracts, and the contractors do not find it to their interest to impart correct reports on matters of exports and imports. Thus only a rough idea can be acquired ; and the following information has been taken from the Persian Gulf Trade Reports and inquiries from other sources.

"The average annual export for five years (1879 to 1883) from Bushire to England, India, Java, Aden, Red Sea, has been valued at 38,000 rupees ; but 30,000 rupees worth of this has been imported from Busra and Bahrain, so that, really speaking, only 8,000 rupees worth belonged to Dashti, Tangistan, and other districts in the neighbourhood of Bushire. During the same period, the average annual export from Bahrain, including partly Katif and el-Hasa, to Aden, Red Sea, Muscat and its dependencies, Zanzibar and India, has been worth 81,800 rupees.

"The average annual exports from Bunder Abbas, which include those of Minàb and Shamilat, to India and Muscat, have been valued at 1,07,400 rupees. Exports from Muscat to India, Yamen, America and Zanzibar have been estimated at 769,800 dollars annually ; and it is alleged that other ports, such as Soor, Kharyyàt, and Batnah, also ship large quantities, which are estimated at twice the quantity exported from Muscat (that is, 1,539,600 dollars).

"I have not yet obtained all the information as regards exportation of dates from Busra to foreign countries ; but the average annual export from Busra to Muscat and various parts of the Persian Gulf is estimated at 3,40,360 rupees. I have been promised the above information, and I shall be glad to send the same to you, when received."

In order to make the foregoing more easily grasped I have placed the whole in the form of a table herewith given :—

Annual Trade in Dates in the Persian Gulf (average of five years, 1879 to 1883).

From ...	Busrah and Bahrain	30,000 rupees.	To From Bushire to	England, India, Java, Aden, Red Sea	38,000 rupees.
From ...	Dashti, Tangistan and other districts near Bushire.	8,000 rupees.			
From Busrah.	To Muscat and other parts of the Gulf.	3,40,360 rupees.	Muscat to ...	India, Yamen, America, Zanzibar	769,800 dollars.
From Bunder Abbas (including Minab and Shamilat).	To Muscat and India.	1,07,400 rupees.			
From Soor, Kharyyat & Batnah.	To other places not named		...	...	1,539,600 dollars.

E.

Rainfall in various parts of India and the Persian Gulf.

The following figures were kindly furnished by Mr. Hill, Meteorological Reporter, N. W. P. and Oudh :—

	Average of	Annual.
Lucknow	16 years	36·61 in.
Mooltan	21 „	7·26 „
Jeypore	16 „	23·74 „
Ajmere	20 „	22·81 „
Nagpore	36 „	44·05 „
Hyderabad (Deccan) ...	14 „	30·50 „
Bangalore	47 „	35·68 „
Bickanir	5 „	14·74 „
Ulwar	11 „	29·11 „
Jodhpur	9 „	13·72 „
Oodeypur	9 ,	26·24 „
Bellary	29 „	17·77 „

All the centres of population in Rajputana are eminently suited to the date palm, and so is Bellary. If once established in those places, its extension in the surrounding country would be only a matter of time.

Mr. J. Cameron, Superintendent of the Government Gardens at Bangalore, gives the following additional information regarding the climate of that station :—"The Bangalore climate is very genial, but six months in the year (December to June) are almost rainless, and during the past 6 or 7 years, the average (35 inches) rainfall has been lighter than usual. During the months of December to January, the thermometer will occasionally descend during the night to 52°, and rise subsequently during the heat of the day to 105°."

In Lucknow, the alternations of temperature in the winter are also great, and in the first week in January, one year I found the thermometer on the grass one morning 5° below freezing point. Down to freezing point it has often been observed in the winter in Lucknow, yet this low temperature does not seem to harm the date palms there.

In Mooltan, which is about three degrees of latitude further north than Lucknow, I should say the nights in winter are still colder, and yet the date palm flourishes and fruits abundantly.

Throughout Arabia and the Sahara, and in fact in all desert climates, the alternations of temperature are very great. Though very hot in the day, owing to rapid radiation from the earth, after sunset, the temperature becomes cold at night, yet the date palm delights in those climates, although it is only met with in the oases. Of course, a very low temperature, as Sir Oliver St. John has observed, will kill the date palm, but so it will many other trees.

The following information about rainfall in the Persian

Gulf was kindly furnished by A. R. Hakim Khan Bahadur, Assistant to Political Resident. Average rainfall at—

Bushire	...	1879 to 1884	13·68 in.
Bassadore	...	1876 to 1880	5·91 in.
Muscat	...	1879 to 1884	4·22 in.

(Whitaker's almanac puts the rainfall at Muscat about 6 inches.)

The rainfall of Busrah is considered to be a little more than that of Bushire. During the first part of 1885, however, there has been an unprecedentedly heavy fall of rain in all the districts of the Persian Gulf, and that noted at Bushire, up to 19th March 1885, was 23·43 inches.

F.

The date palm would, I have little doubt, be invaluable in other places than India. For instance, in all the dry parts of Australia.* Even if not wanted for human food, it would make an admirable food for cattle.

In New Zealand and Tasmania, probably it might be introduced with advantage.

Also in the Cape, and other places where the rainfall is not too great, and the cold in winter not excessive.

G.

In Bordighera, in the south of Europe, the date palm is largely grown, but for a different purpose from that to which it is cultivated in the Persian Gulf. In Bordighera the leaves

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* The date palm appears just the fruit tree most suited to the Central Australian desert round the water holes. Where camels can exist, there the date palm will do. It is said that, in some parts of this desert, the annual rainfall is from 4 to 8½ inches. In Muscat and Mooltan, where the date palm thrives wonderfully, they get no more rain. The date palm might make population possible in this Australian desert.

of the palm trees are swathed (as we do lettuce) in order to blanch them, and prepare them for church ceremonials. On Palm Sunday at Rome, and in certain Jewish festivals in August, a large number of blanched palm leaves are consumed.

All these come from Bordighera. It is no wonder, therefore, that the date trees of the South of Europe produce worthless dates.

It is said that the date palms of Bordighera were originally introduced there by the Dominican friars, from Spain, and in the latter country, they were, no doubt, introduced by the Arabs, or Moors from Morocco, the opposite side of the Straits of Gibraltar.

H.

The following are the names of varieties of dates in the Persian Gulf, and which are met with in the foregoing chapters. By the help of Baboo Baleshwar Parshad, Deputy Magistrate, and his friends, I have been able to make out the meaning of most of them. It should not be supposed, however, that these are the only kinds of dates to be found in the Gulf, because it is stated that the number of varieties are over a hundred—all with distinct names. It may have often happened that at first a new variety occurred from seed, and may have been only known and propagated among a certain tribe of Arabs, and therefore was only a local variety. When its good qualities became known, naturally it would have been given the name of that tribe or locality, which name it would have retained when, through its superior qualities, it became disseminated elsewhere. Certain names then may have been acquired from some striking quality either in the color, or flavor, or size of the fruit, or size and appearance of the palm.

Names of Varieties and their Probable Meaning.

Abù-naranjà... ...	Name of a tribe, or 'the father of reds.*
Ab-dandàn	Probably 'like brilliant teeth.'
Alí-Mèhtari	Name of a tribe.
Asgar	Small (probably from the size of the palm-dwarf or from that of the fruit).
Azàd	Free (probably in loose bunches).
Baraimee	Not known.
Barahee	Ditto.
Chehelgezzee ...	Forty yards high (probably the Persian yard is not three feet).
Chattàn	Not known.
Dairee	Of the world (grown everywhere).
Dang-safèd	Brilliant white.
Fardh	Single (probably disposed on the stem by ones).
Firsee	Not known.
Guntàr	Ditto.
Hamrànee	Red.
Hellow	Sweet.
Helawi	Ditto.
Jowzee	Like a nutmeg, or walnut.
Kabkàb	Not known.
Kalak-soorkh ...	Red pen (probably refers to the fruit stalks).
Kandee	Like sugar.
Kasp	Not known.
Kaidee	A prisoner (probably refers to the bracts which enclose the date).
Khálàs	Pure, 1st quality, superfine.
Khamree	Of which liquor is made (some kinds are exported to India, and distilled for arack).
Khanaizee	Name of a tribe.
Kharoo	Having many thorns (probably refers to the spines on the leaves).
Kharak-gotoo ...	Large size.
Khatoon-shehàbee ...	Red lady (probably refers to the brilliant red color of the fruit).
Khassàb	Not known.

* Red being one of the date colors.

Khudràwee ...	...	Self-growing (probably refers to its growing *self-sown*, from seed).
Khoshà kharak	...	Very large bunches.
Loolooi ...	...	Like a pearl (may refer to the small round size of date),
Malak Soorkh	...	Red angel (probably refers to fine red color of unripe date).
Maksheeb ...	...	Not known.
Maktoom ...	...	Hidden (may refer to the dates being hidden by the foliage).
Mandal ...	...	Round.
Marzaban ...	...	Guardian of the city (may refer to tallness of palm, overlooking walls of the city).
Maznàj ...	...	Not known.
Mosalla ...	...	Ditto.
Murda-sang ...	...	Stoneless (or with a very small stone).
Mosallee ...	...	Not known.
Naghal ...	...	Ditto.
Neereedheenee	...	Not known.
Rekàb ...	...	Shaped like a stirrup (probably refers to the drooping of the foliage, giving an outline of a stirrup).
Rash ...	...	Not known.
Salàni ...	...	Ditto.
Sa'ameràn ...	...	Ditto.
Sarashee ...	...	Sticky (probably from excess of syrupy juice).
Soorkh Dang...	...	Brilliant red.
Seesee ...	...	Name of a place.
Sàyer	...	Common, found everywhere.
Shakar ...	...	Sugar.
Shakaree ...	...	Like sugar.
Shahoonee ...	...	Royal (fit for the king's table).
Sheikh-ali ...	...	Name of a tribe.
Sheikh Kamàli	...	Ditto.
Sheerinee ...	...	Like a sweetmeat.
Shirsee ...	...	Not known.
Zahidee ...	...	Saintlike (probably means very good in everyway).
Zarrak	...	Shining, having a glassy surface.
Zainadheenee ...	...	Not known.

I.

It is not impossible that we may yet obtain in India some new and important varieties of the date palm, which will place the date tree on a different footing from what it has hitherto been. Nobody has yet attempted to handle this wonderful tree in a scientific manner. All that has been done yet by Arabs, Persians, Mooltanis, Sindhis, has been by the 'power of God.' All crosses and the resulting varieties have been *natural* crosses. If this tree were taken up intelligently, and crossed with the view of obtaining particular results, there is hardly any doubt that the same wonderful success will follow as that which resulted from the crossing of other fruit trees and other plants. The pollens and ovaries of the different kinds can be manipulated almost as one wishes, and are as so much clay in the potter's lands. Of course, time and patience and perseverance are required. Without these nothing can be achieved. The manipulation is one of the easiest. It is enough to collect the pollen of one distinct class of date palms, and shake it in a still atmosphere over the pistils of some other distinct kind. The pollen can be kept in a fertile condition for many weeks. Already Mr. Ridley has succeeded in crossing the Phœnix dactylifera (date palm) with the pollen of the Phœnix sylvestris (khajoor). But the palm that promises most, I think, is the Phœnix acaulis, a dwarf bushy species, which is very common about the Nainital Hills, Kheree, Pachmari, and other parts of the Central Provinces. It is an indigenous kind. The female has scarcely any stem, but the male has often some sort of stem. It bears in profusion a small black sweet date, which natives are very fond of, and which *ripens in May*. This is the most important point of the dwarf palm. The fruit of the Phœnix dactylifera, or Arabian date palm, *ripens in September*. Now, if a successful cross could be effected between this dwarf palm and

the Arabian date palm, a revolution in date cultivation might be the result. A useful date that would ripen in May might then be cultivated *throughout* India, where the climate would not be too cold. What I mean by a successful cross is one that would yield *seed*, and that the seed would *germinate* and *live*. Those who have practised crossing know that often fruit results, but sometimes it *has no seed;* and if it has, the seed may *not germinate;* and if it germinates, it may *not live*.

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