

WAS THE BIBLICAL MANNA AN ANIMAL PRODUCT?

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WHAT was that "manna," that marvelous food which is purported to have sustained the Hebrews for forty years while they wandered in the wilderness of the Sinaitic peninsula? Was it the dried sap of a plant, or was it some animal substance produced by an insect? The theologians, linguists, botanists and the geographers have all made their guesses upon this problem, without giving a satisfactory answer to it. The writer proposes to look into it from the ethnological point of view, by finding out what some desert-dwelling tribes of the present day live on, and then comparing such edible substances with the biblical description of manna.

The usually accepted explanation is that manna is a vegetable product, occurring normally in nature, and even entering into commerce. Annually upon the twigs of certain species of evergreen trees and shrubs, known as "tamarisks," a saccharine-resinous exudation appears. The tamarisks grow on salt deserts by the seashore, or in infertile districts in sub-tropical regions of the eastern hemisphere, as for instance, along the shores of the Mediterranean Sea. They will withstand great drouths. On the north side of the sea, the manna-ash tree is regularly tapped for a sugary-product sold as "manna." When sap is freely flowing in the tamarisk shrubs, a species of stinging insect, the *coccidae*, punctures the thinner barks, and feeds on the sugary sap. These *coccidae*, like the aphides, are often "milked" for their sweet secretions by ants. The wound made in the twig does not immediately heal, but some sap runs out in a tear-like form, and soon hardens into a small roundish pellet, thus sealing up the puncture. This dried sap from Persia and Arabia enters into commerce under the name of manna. The color is light brown, the taste is sweetish, the odor is senna-like, and

the size varies from that of a mustard seed to the dimensions of a coriander seed. It is used as a mild purgative. The manna of commerce is not solely derived from the tamarisk shrub, for oak-manna is collected too. It is found in some localities in the form of agglutinated tears clinging to twigs. Chemical analysis shows that oak-manna is almost entirely a nutritive type of sugar.¹ A recent issue of a Chicago newspaper prints a dispatch from Jerusalem stating that it has been discovered that the tamarisk-manna is the secretion of the coccida which lives on tamarisk. The dispatch as printed is absurd—the coccida does not secrete the hard pellet; for if it did, it would be in need of a stronger purgative than manna.

Other students of this problem say that the total amount of tamarisk-manna is too inconsequential to have fed more than a few hundred persons on the desert. Paul Haupt endorses the view of Littré, and states that the manna of the ancestors of the Jews was a nutritive lichen, especially the *Lecanora esculenta*, known as manna-lichen, which has served as food for considerable numbers of men when drought and famine struck the steppes anywhere from Algeria to Tataria. Fragments of manna-lichen carried by the wind resemble grains of wheat, but they may vary in size from that of a pea to a hazel-nut.² These edible lichens contain starchy substances, and in some case, some saccharine matter too. Haupt believes the Hebrews mixed manna-lichen to sweeten it, with tamarisk manna. It is necessary to conjecture this mixing because the manna-lichen, being mainly starchy, is hardly sweet enough to be worth special mention as given in the biblical description.

The biblical account of the appearance of manna on the desert, as given in the sixteenth chapter of Exodus, reads: "And when the dew that lay was gone up, behold, upon the face of the wilderness, there lay a small round thing, as small as hoar frost on the ground." Then we learn that it did not keep more than a few days when it "bred worms and stank." Furthermore, it could be gathered every morning, and was in fact necessary, because "when the sun waxed hot, it melted." It was called "manna, and was like coriander seed, white; and the taste of it was like wafers made with honey." Some additional information is given in the second chapter of Numbers. The color of manna was that of bdellium. Apparently that means

¹ Ency. Brit. 11th Ed., Art. *Manna*, Vol. xvii, p. 587-588.

² Dr. Paul Haupt, *Manna, Nectar and Ambrosia*, Proc. Am. Philos. Soc. Phila. 1922, Vol. lxi, p. 227 sq.

that it was white with a yellowish or amber cast. Moreover, it was beaten in mortars, and baked in pans, and cakes were made of it; and it had a pleasant oily taste. "When the dew fell upon the camp in the night, the manna fell upon it." Still another thing we learn from the bible, is that the appearance of manna was coincident with the appearance of quail, which suggests that the manna attracted the quail, as if manna was their normal food at some season of the year. At length the Hebrews lost their taste for manna, and then it became loathsome to them. Finally, when they were able to grow their own grain, they quit using manna, and it miraculously ceased to appear. The fact that they ceased to use it when they had grain, and the fact that it was wormy, and "stank," and was loathsome, goes to prove that it had very few qualities to commend it as a food, even if it was heavenly bread. Of course it never ceased to appear, but the later descendants of those early pioneers, lost track of its identity, by which oversight, they created our problem.

Manna-lichen seems hardly to conform to the description of the biblical manna, except that it is found in the desert, is often roundish, and very plentiful as compared with tamarisk manna. Tamarisk-manna or even oak-manna seems to conform to the biblical specifications in these particulars: it is small, roundish, or oval, whitish or yellowish brown. It is sweet to the taste, and is frequently gathered in the morning; it is nutritive too. Very likely it can be beaten or ground in a mortar, and molded and baked into cakes. On the other hand, there are a number of potent reasons militating against the identification of the tamarisk-manna with the biblical. In the first place it is not normally found on the ground, but is found clinging to the twigs of small trees and shrubs. It does not make its appearance only at night after the dew has fallen. Its presence in the twigs is not coincident with the flocking in of quail; and quail feed off the ground rather than off the branches and twigs of trees. Tamarisk manna is hardened and made permanent in form by reason of the heat of the sun, drying up the liquids in the sap, and it is not melted regularly off those twigs, to run down the tree trunk each day. It might melt or dissolve in rainy weather, but not after the sun has driven away the clouds. In fact, oak-manna is often gotten by soaking the twigs in hot water to dissolve the dried globules of sap. Then too, tamarisk-manna, like sugar, will keep rather indefinitely, and will not on occasions, and on every other day

or so, become infested with vermin. That some insects do actually get imbedded in the sticky sap and become mummified therein, is certain; but these accidents are somewhat rare. The little insect in such cases would be dead, and could hardly be said to breed worms. It seems that this biblical manna must have contained the eggs or larvae of some insect or worm, even when freshly gathered. It is inconceivable that tamarisk-manna after clinging to the twigs for weeks or months, should upon being handled by man, begin to putrefy in a few days, and give out a terrible stench; for it being mainly saccharine matter, will no more rot than starch or rock-candy. Putrefaction or fermentation would have taken place while the drop of sap was still liquid, prior to its hardening. There is nothing so positively vile about tamarisk-manna, or even manna-lichen, as to make men loathe it. We are forced, there, to discard the vegetable-sap explanation, and to seek out some other natural product of the desert regions, that is edible.

The Shoshoni and Ute Indians of Nevada were living virtually on a desert, where food was so scarce that not infrequently, they starved to death in the winter. They gathered live ants, dried them and ate them. Ants and grasshoppers were parched with hot embers, and used to thicken soup. In drier parts of Central California, dried chrysalides, as well as worms were a delicacy;³ the Maidu ate the larvae of wasps.⁴ The Mohaves on their desert supplemented their diet of seeds, quail and rabbit with insects. At the brackish Owen's Lake, the larvae of flies were scooped from the water and eaten by the Indians. Lizards, snakes, grasshoppers and crickets were relished in Lower California, where aridity holds sway.⁵

In South America, the Resigero tribe have special baskets for edible ants. The Issa-Japury tribe will eat the grubs of wasps and bees, in fact any larvae.⁶ Australia is more desert than anything else, and natives are driven to extremities to get food. Moths are pounded and smoked, so that they will keep for several days before eating. The taste is like that of a sweet nut; and even dogs will fatten on such food. Ant's pupae or "eggs" are also a favorite food,

³ H. H. Bancroft, *The Native Races of the Pacific States*, San Francisco, 1886, vol. i. p. 374.

⁴ Dr. A. L. Kroeber, *Handbook of the Indians of California*, Wash., 1925, Bull. No. 78. Bureau Am. Eth. p. 409.

⁵ Bancroft, *Op. cit.*, p. 560-561.

⁶ Thomas Whiffen *The Northwest Amazons*, N. Y., 1915, p. 97, 130.

with or without ants themselves. Many kinds of grubs are eaten.⁷ They make a drink from crushed ant-larvae, but this drink is said to be sourish,⁸ probably on account of fermentation. In South Africa, the Bushmen have been driven onto the Kalahari desert within historic times. No small share of their food is "Bushman-rice," as it is called by the Dutch settlers. It is the whitish chrysalides of the white ant, obtained from ants' nests. The natives dig out the nests and sort out the sizes of the larvae on a kind of grass sieve. They only gather what they need for the day, just as the Hebrews gathered their manna. The Bushman-rice is taken to the caves and roasted and eaten. The natives get fat on insect food, it is said.⁹ In semi-arid Central Australia, there is a remarkable honey-ant which lives in red sandy loams. The women dig out these nests to a depth of five feet or more, and collect the ants. The honey-ant itself is a modified worker of the colony, so overfed that its abdomen swells to the size of a marble, in consequence of the honey stored within. The abdominal walls are reduced to extremely fine membranes through which the honey can be seen. It appears that the inflated ants in this phenomenal way, provide for the needs of the colony during the barren season, acting in the capacity of living barrels that can be tapped as required. When eaten, the first sensation the palate receives, is a distinct prick of formic acid; but this is both slight and momentary, and is followed by a rich flavor of pure honey.¹⁰ As the reader now probably realizes, the writer's thesis is that the manna of the bible was none other than the roundish to oval-shaped, whitish to yellowish-brown larvae of the ants that inhabit the arid to semi-arid regions of Arabia-Petra. In short, manna is "Bushman-rice."

"Ant-eggs" as children call them, are really ant-cocoons—the pupae of ants asleep in a silken shroud. Sometimes the ant-eggs are simply the matured and naked white-skinned larvae that have never received a silken wrapper about them, for some reason. Ant colonies collect into "nests;" as many as two hundred being found in a forty acre area in places. The ant is a nectar-eating, sap-sucking, semi-carnivorous insect, requiring considerable moisture in its environment, and yet it cannot live in swamps. It will burrow

⁷ N. W. Thomas *Natives of Australia*, London, 1906, p. 110-111.

⁸ Hermann Klaatsch, *The Evolution and Progress of Mankind*, London, 1923, p. 125.

⁹ G. W. Stow *The Races of South Africa*, London, 1905, p. 58-59.

¹⁰ H. Basedow, *The Australian Aboriginal*, Adelaide, 1925, p. 146-147.

into the earth fully seven feet to secure wet faces of earth that it can suck or lick for the needed moisture. Living underground in this way, it can endure and thrive in a land of pronounced aridity. In arid climates, where there is a thin overburden of earth upon beds of calcareous and sandy stone, as in Arabia Petra, the hot sun dries out the soil to a considerable depth, so that, it appears, the ants have to find their needed moisture in the evening dews and damps that condense from the breezes blowing in from the nearby sea. While they were in Arabia Petra, some authorities conjecture that the Hebrews rarely ever got more than fifty miles from the coast, and frequently were no more than fifteen miles.

In an ant colony, that branch of the workers known as the nurses, go about their care of feeding and massaging the ant larvae in various stages of development. These larvae are roundish, legless, footless, helpless maggots, with very small heads. When the larvae are full grown, they have enlarged from the size of a pin-point to that of a wheat-berry, nearly a quarter of an inch long. The size varies with the species. While developing, the larvae are stuffed to the limit with the syrup liquid that has been stored up in the "animated pantries," and which is fed or possibly forced-fed into the larvae by the nurses. The nurses vary the amount of food given to the individual larva, so as to pre-determine sex, and especially to keep a host of them at the same stage of evolution on the same day. The development of the maggot is delayed or hastened according to the weather's humidity, or the temperature. At maturity the larvae generally spin oval-shaped cocoons about their bodies, but many do not do this. The cocoon is white in color, or of an amberish white. The larvae having no cocoons are white, although the color of the food in certain localities may give them a yellowish, or possibly some other shade. Within the cocoon, the larvae pupates. It passes through a chrysalis phase of evolution, in a silk-lined limbo, to emerge in time into its heaven, as an angel of an ant. The period of pupation ordinarily takes from three to four weeks. It varies with the weather; and one observer says 102 days elapsed before the pupa emerged as an ant. The cocoons are attended to faithfully by the workers, who carry them at times from room to room, or from level to level, as the temperature or the moisture or time itself may demand. At times the nurses see fit to bring the

cocoons to the surface, and leave them exposed for a while. We can only conjecture what this is for.

The writer has observed in Oklahoma that cocoons are brought to the surface, in hot dry weather, when a moist and foggy wind blows in from the south, as it commonly does for a day or so preceding a rain. At other times it would seem that cocoons can be found at the surface, on the first bright day after a rain. It is likely that the period of exposure does not exceed an hour and a half, for the workers are busily engaged in a continuous operation of bringing up new cocoons and taking down the exposed ones into the formicary, or ant-hill. The air in some ant-colonies is said to be heavily charged with carbon-dioxide. These cocoons that are brought to the surface seem to be in need of moisture that can be absorbed hygroscopically out of the humid air; or else after a rain, the cocoons are too wet, and have to be dried out a bit. Again they may be brought up for the sake of freeing them from excess carbon-dioxide, and for giving them an oxygen bath. We do not know for certain. When the sun is out hot and scorching, the cocoons soon disappear off the ant-hill. Obviously, this is necessary because the pupa being fairly stuffed with liquid food, would quickly shrivel up to a hard sugary lump in bright sunshine, inasmuch as the cocoon is quite thin, and unquestionably porous, and the larva and pupa are fairly translucent. The matured ant has an opaque carapace as its body, but the eggs, larvae and pupae must have plenty of moisture to keep themselves and their interiors liquid.

Many insects spin silk-threads from internal secretions. Chemically considered, silk is composed of an outer albuminous coating over a horn-like albuminoid cord. The outer covering is soluble in hot water, and all of it is soluble in mineral acids and strong alkaline solutions. It is highly hygroscopic; that is, it will give up contained water under drying conditions, and will reabsorb it again under reversed conditions. When dry and devoid of water the silk threads, or silk-cocoon, is rather stiff in texture, but becomes pliant when moist. Spider-webs are made of silk-threads. When used for cross-hairs in surveying instruments they sag on humid days, and then grow taut when dried out. It is probable that this hygroscopic property of silk makes it possible for cocoon-spinning insects to live in places of little rain, or even of pronounced aridity. The skin of a pupa is like a parchment in appearance, and the silk of the

cocoon is in contact with that parchment. Parchments frequently have the property of osmosis, by which virtue, moisture can pass through the parchment without puncturing holes in it. It is quite likely that the purpose of the cocoon in addition to being a protection, is to take up atmospheric waters, and pass them on through the parchment to the chrysalides within. When the cocoon is water-logged as after a rain, it may often have to be brought to the surface to be dried out, and then when it is too dry, so that the pupa suffers, the cocoon is brought up to drink in the dews and damp. After exposure, the cocoon is taken down again before the hot sunshine can dissipate what water has been absorbed from the air and the falling dew. In that sense, the "manna" melted or disappeared when the sun waxed hot; and it made its appearance "when the dew fell upon the camp in the night."

Silk being an albuminous substance, and an animal product, can be digested by many creatures. Even man's body absorbs the surgeon's silk-thread. It is said that ants will even eat spider's silk. Fishes are fond of the dried larvae and the shriveled ant-cocoons that bird-stores sell. Snakes and lizards are also fond of larvae. Birds of the pheasant family, particularly quail, are especially fond of ant-cocoons. This is an established fact. The entire cocoon, inside pupa, and outside silk must be readily digestible.

So much for ants on deserts, and man's eating of ant-cocoons, and their sugary content, and the appearance of cocoons upon the ground in the dews of night, and their disappearance in the heat of the day, and the presence of quail in ant-infested regions. Now we have to hypothesize that the Hebrews on the whole were quite unfamiliar with ants and their habits; and on that account they thought the cocoons were tiny loaves of bread sent to them by Jehovah. Since the bible tells us that those who felt the bondage to the Egyptians most, were working in the clay-pits and making brick, we can conjecture that they lived in a wet and boggy locality, where ants were very rare. Again those that farmed, probably irrigated, and drowned out or discouraged ants. Or again, the ants got all the moisture they needed from the sub-soil and alluvium in the lower plains of the Nile where the Hebrews are supposed to have lived; and on that account, they rarely brought up their cocoons to the surface to be exposed during the pupating period. At any rate,

when they came upon great numbers of these white pellets on the desert, they asked in ignorance "What is it, *manna*?"

In the very early stages of pupation it is likely that the Hebrews failed to see the "vermin" that was within the cocoon; for then being legless with only a spot for a head, it would not be a prominent characteristic. The manna was gathered in pots, and was "seethed," that is, it was boiled. Others dried the stuff it would appear, and then mashed it up in mortars. As the stage of pupation advanced from day to day, the ant or the "vermin" in the cocoon took on more definite form; and it was also discovered that "seethed" manna gave forth a terrible stench when allowed to stand a day or two. Workers in the early stages of preparing raw silk for the markets, are well aware that the *sericin* or outer albuminous coating of the threads, is separated from the core of the thread before spinning on reels. The raw silk is seethed in hot water, or soaked in warm water for several days to loosen the sericin. In European towns these soaking-vats are commonly outside their bounds, because of the unbearable stench given off by the fermenting sericin. Truly then, seethed manna "stank" after the second day, or the third. Therefore Moses "decreed," in pursuance to actual practice, that only enough manna should be gathered as would suffice for the day's needs. But the supply for the sabbath had to be gathered the day before, in anticipation of the fourth commandment of the decalog which as yet had not been received. And finally when the stage of pupation was far advanced in all the colonies that were sought out by the Hebrews, they naturally came to loathe the manna that had fallen from heaven. Then it seems they must have had to resort to quail, which flew up from the Gulf of Akaba where even to this day they are plentiful. Quail were so numerous that they gourmandized on them, and fell sick as a consequence, as related in the eleventh chapter of Numbers

The bible says the Hebrews marched out of Egypt with 600,000 men in "harness," or as we would say nowadays, "in warrior's equipment." The figures are absurd; for with such an army, they could have conquered Egypt, and would not have been fought to a standstill for some time by a mere handful of Amorites living in a few villages in the hills. Probably not over 2000 men were "in harness," and the whole number who went out to return to their brethren living on the borders of Edom and Moab, did not exceed

6000 people. It is only in regard to the preposterous figures of the multitude who were fed part of the time on this manna, that this thesis fails seriously; but in that weakness, all the other theories examined also fail. The identification of manna with ant-cocoons, and ant-pupae, meets with very nearly all the "specifications" laid down in the bible. It fails only on the side of the preposterous statements, such as 600,000 warriors, thus implying nearly 2,500,00 people; and it fails to meet the biblical implication that it could be found every day in the year; and again it fails in the piously fraudulent assertion that the "manna" failed to appear any more upon the ground after the people gathered their first grain-crop. The weaknesses in the thesis really do not militate appreciably against its acceptance.