

Archaeological Potato Tuber Remains from the Casma Valley of Peru¹

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A collection of 21 preserved tubers of the potato from 4 archaeological sites situated in the Casma Valley of Peru is illustrated and described. The collections from these sites date from the Preceramic Period (2000 B.C.) to the Initial Ceramic Period (1200 B.C.). Identification of the tuber remains was undertaken through a study of their starch grains. Comparative material used for this purpose included other archaeological collections of tuber remains from the sites of Chilca and Pachacamac, as well as the fresh and dried tubers of modern-day wild and cultivated potato species.

Few well authenticated examples of potato tuber remains from archaeological sites in Peru, the ancient homeland of the potato (Ugent, 1970), are known from the literature. A collection of small tubers, about 1 in in diameter, was recovered by the archaeologist Max Uhle in his excavations of the ruins of Pachacamac, near Lima. Harshberger (1898) describes these as being similar in size to those of the wild tuber-bearing *Solanum* species. Tubers examined by Towle (1961) and Ugent (Fig. 4H of the present paper) also confirm the existence of the potato at Pachacamac, and suggest the use of the tubers of this plant for food from the early Inca Period (1000 A.D.) onwards. MacNeish et al. (1975), on the other hand, has evidence of man using the potato as food as early as 3800 B.C., and Engel (1970) tells of finding dried tubers of the potato in the caves of Chilca Canyon, the radiocarbon dates for which suggest that the tubers were brought in as food by man as early as 8000 B.C. However, it is not known in this case whether the potatoes of the Chilca Canyon were actually cultivated deliberately by man or simply gathered in the wild.

With the exception of the above cases, the remaining reports of archaeological potato tuber remains extant in the published literature await either further verification by the taxonomist or better collecting techniques by the field worker. Kidder (1956), for example, describes a series of 12 charred tubers collected from the ruins of Chiripa on the shores of Lake Titicaca, but Towle (1961), who reexamined the material, was unable to say with certainty whether the charred remains were that of the potato or that of some other common Andean root crop, such as achira, oca, ullucu, jicama or sweet potato. To compound matters, Ponce Sangines (1961) describes another collection from the shores of Lake Titicaca, this time from Tiahuanaco, and assigns it to the Formative Period (300 B.C.), but Bushnell (*in Hawkes*, 1967) believes an error was made in the dating as the excavations were made in an area of "fill" at the temple site, and therefore the stratification would appear to be false. Tubers described by Safford (1926) are

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without locality data, and material from near Ancon described by Patterson and Lanning (1964) is not that of the potato (*vide* Hawkes, 1967).

In the present work, a series of 20 potato tubers unearthed from the middens of 4 archaeological sites located near the coastal desert city of Casma in central Peru (Department of Ancash) is described. The tubers were positively identified as belonging to the cultivated potato (*Solanum tuberosum* L., *sensu lato*) by their extant surface features and by their starch grains, which are unlike those of other cultivated tuber-bearing plant species, including the 5 Andean root crops mentioned above (Brautlecht, 1953; Whistler and Paschall, 1967). Moreover, the starch grains of the cultivated potato are distinct from those of all wild species of tuber-bearing *Solanum* yet examined.

The preserved potato tubers described here, dating from 1200–2000 B.C., were collected in connection with an on-going archaeological project of the second and third authors, and the material has been on 1-yr-loan from the Peruvian Instituto Nacional de Cultura. It is fully expected that additional tuber materials will be described from these sites (and other closely adjoining ruins) as the archaeological phase of this work progresses.

DESCRIPTION OF THE ARCHAEOLOGICAL SITES AND TUBER REMAINS

Location C1.—Pampa de las Llamas-Moxeke

This early Ceramic site is located inland on the Moxeke branch of the Rio Casma (Fig. 1). It covers an area of about 2,000 by 1,100 m and includes both the mound of Moxeke and another large mound, this facing the first, as well as an extensive area of both small mounds and domestic architecture. Bordering the clusters of domestic architecture are the small mounded midden deposits which were sampled in connection with the present study. Although controlled stratigraphic excavations have been attempted in this particular area, the tubers available for this study came from a series of 1 m² test pits dug into the various middens in order to gain a better understanding of their contents. Pottery and other artifacts unearthed from the middens and domestic structures of Pampa de las Llamas-Moxeke indicate that the occupation of this site dates from the Initial Ceramic Period, 1800–1500 B.C. Plant remains from this site include both the white potato and the sweet potato.

Preserved remains of the white potato are represented by the following 5 tuber samples:

Specimen 1 (Fig. 2G).—Tuber flattened, irregularly orbicular, about 19 mm in diameter and 12 mm thick, concave and irregularly compressed on both sides. Probably once globose in shape. Skin wrinkled, torn in places and showing signs of charring, perhaps by open fire. Surface features include 2 shallow eyes, these about 2.5 mm in diameter, and place of stolon attachment. Skin color castor brown (Maerz and Paul (M. & P., hereafter), 1950, Color Atlas Plate 16–C8). Weighing 2.7 g, this tuber is the heaviest known for the Casma area. Provenience data: C1B–1 = 13 (1 of 2); area B, test pit 9.

Specimen 2 (Fig. 2H).—Tuber flattened, nearly orbicular, 15 mm long, 14 mm wide and 9 mm thick. Skin wrinkled, damaged by scab, with a semicircular area of about 5 by 6 mm missing. Surface features include 4 small eyes, these 1–1.5 mm in diameter, and place of stolon attachment. Skin color acorn brown (M. & P., 1950, Plate 15–E7). Weight 0.75 g. Provenience data: C1B–1 = 13 (1 of 2); area B, test pit 9.

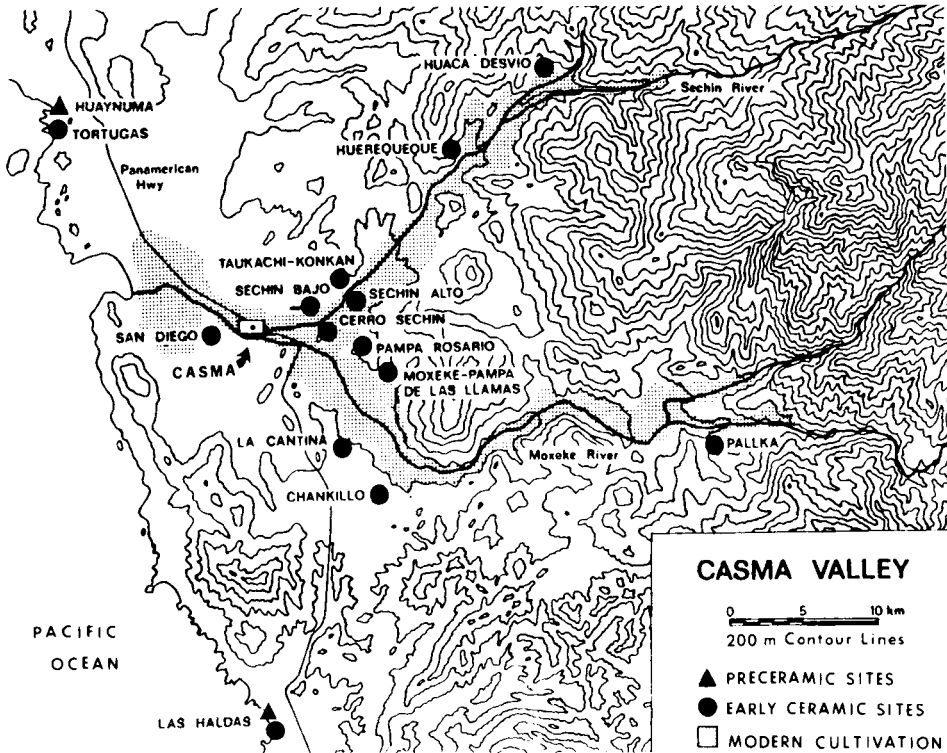


Fig. 1. Archaeological sites in the Casma Valley and the coastal region of the Department of Ancash in central Peru.

Specimen 3 (Fig. 2I).—Tuber broken at one end, nearly $\frac{1}{3}$ missing, the fragment 10 mm long, 10 mm wide and 8 mm thick, flattened and probably once nearly orbicular in shape. Skin wrinkled, cracked, with no evident surface features. Skin color chukker (mummy) brown (M. & P., 1950, Plate 15–C8). Interior of the tuber appearing as charred for a distance of 1.5 mm beneath the skin. Central portion of the cortex is hardened and obsidian-like in appearance, the color being Brazil red (M. & P., 1950, Plate 4–K12). The interior cortical cells, softened in water and shown in phase contrast in Fig. 4A, are from 90–160 μm in length. Weight of tuber 0.43 g. Provenience data: C1B–1 = 21; area B, test pit 8.

Specimen 4 (Fig. 2J).—Tuber flattened, broadly elliptical, 23 mm long, 22 mm wide and 11 mm thick (the largest in size for the Casma series). Skin wrinkled, damaged by scab, with a 6 by 15 mm laceration on one side. Eyes not evident, but a portion of the connecting stolon still attached to one side. Skin color sparrow brown (M. & P., 1950, Plate 15–C6). Starch grains broadly elliptic to ovate, darkly staining with iodine-potassium iodide solution and methylene blue (Whistler, 1964), the largest 90 μm in length (Fig. 3A). Tuber weight 2.49 g. Provenience data: C1B–1 = 28 (1 of 2); area B, test pit 14.

Specimen 5 (Fig. 2K).—Tuber flattened, concave on one side, broadly ovate, 13 mm long, 11 mm wide and 8 mm thick. Skin wrinkled, encrusted with sand and debris. Surface features not evident. Skin color sparrow brown (M. & P. 1950, Plate 15–C6). Tuber weight 0.9 g. Provenience data: C1B–1 = 55; area B, test pit 24.

Location C3.—Huaynuma

This Preceramic coastal site is about 3 ha in area and occupies a protected area on a bay north of the Casma Valley (Fig. 1). No architecture is visible on the

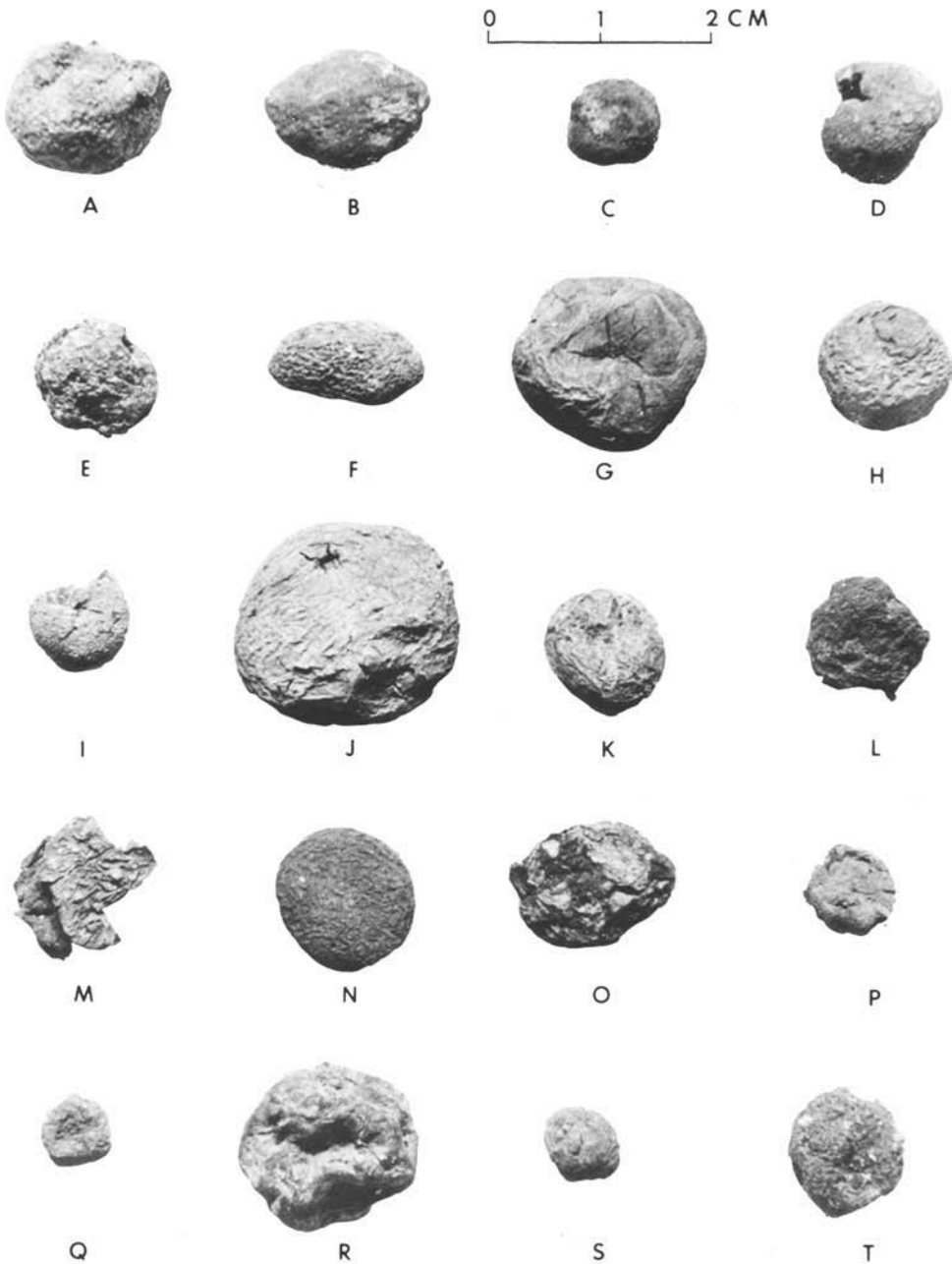


Fig. 2. Potato tuber remains from 4 archaeological sites in the vicinity of Casma, Peru. A-F. Six tubers from Huaynuma. G-K. Five collections from Pampa de las Llamas-Moxeke. L-Q. Six tubers from Tortugas. R-T. Three samples from Las Haldas.

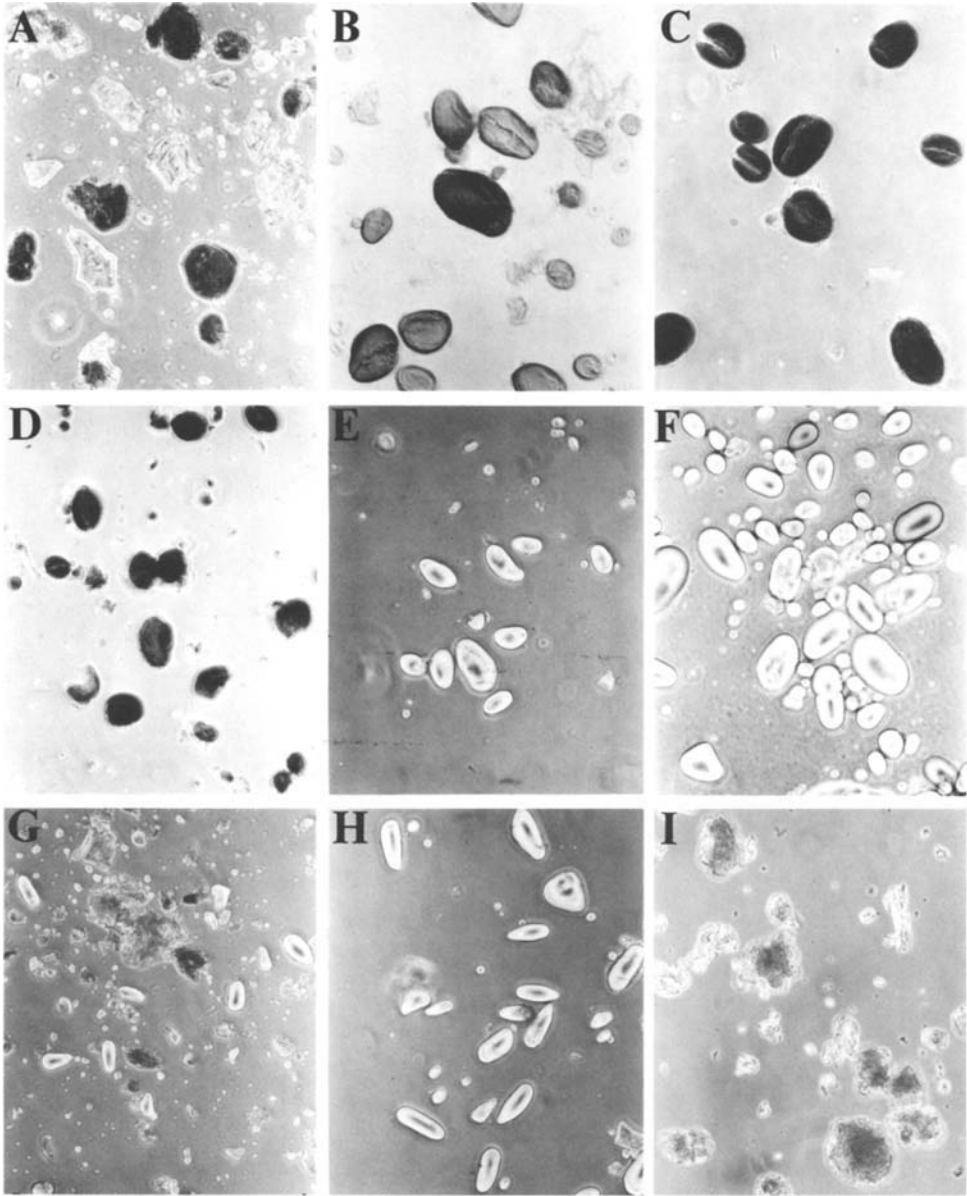


Fig. 3. Starch grains of *Solanum* species (all phase contrast and at same scale of enlargement and magnification, 160 \times). A. Starch from tuber remains of the potato unearthed at Pampa de las Llamas-Moxeke. B-C. Starch from preserved tubers found at Huaynuma. D. Starch from potato tuber collected at the Tortuga site. E. Starch grains of a modern-day tuber of *S. tuberosum* Group Stenotomum (P.I. 365344). F. Starch grains of a modern-day tuber of *S. tuberosum* Group Tuberosum (var. Idaho). G. Grains from the tubers of the wild species *S. megistacrolobum* (Cuzco, *Ugent 3685*, SIU). H. Tuber starch of the wild species *S. canasense* (Calca, *Iltis & Ugent 906*, SIU). I. Starch grains of ten-thousand-yr-old potato tuber remains from Chilca Canyon.

surface, but as a few walls were encountered during excavation of the site, it is probable that there were Preceramic domestic structures there. Some areas of the midden are about 2 m deep. The samples are from controlled stratigraphic excavations made by natural levels. These levels were numbered from the surface down as they were taken out, beginning with 1, and unusually thick levels were divided into 10–15 cm artificial levels designated further by lower case letters. The age of the plant materials is estimated to be 2000 B.C.

Samples of the white potato, achira and the sweet potato were retrieved from Huaynuma. Preserved remains of the white potato are represented by the following tuber specimens:

Specimen 6 (Fig. 2A).—Tuber broken on one edge, strongly flattened, probably once ellipsoid, 18 mm long, 14 mm wide and 11 mm thick. Skin wrinkled and rough, absent in places, encrusted with sand and debris. Two shallow eyes, about 2.5 mm in diameter are evident on the surface. Skin color chaetura drab (M. & P., 1950, Plate 16–A5). Interior of the tuber granular, containing in places sharp pointed clear crystals about 2 mm long. Starch grains broadly elliptic to ovate, staining darkly with iodine-potassium iodide solution and methylene blue, the largest 125 μm long (Fig. 3C). Tuber weight 1.18 g. Provenience data: C3A–2 = 49; cut 2, square 1, level 3d.

Specimen 7 (Fig. 2B).—Tuber flattened on one side, irregularly spheroidal, 17 mm long, 13 mm wide and 9 mm thick. Skin largely absent, the surface granular with eyes and stolon attachment not evident. Surface color coconut brown (M. & P., 1950, Plate 7–C10). Starch grains broadly elliptic to ovate, staining darkly with iodine-potassium iodide solution and methylene blue, the largest 96 μm in length (Fig. 3B). Tuber weight 0.80 g. Provenience data: C3A–2 = 58; cut 2, square 1, level 4a.

Specimen 8 (Fig. 2C).—Tuber flattened both sides, elliptical, 10.5 mm long, 9 mm wide and 6 mm thick. Skin lacking, the surface studded with sand grains and fragments of charcoal. Eyes and stolon attachment not evident. Surface color coconut brown (M. & P., 1950, Plate 7–C10). Tuber weight 0.23 g. Provenience data: C3A–2 = 58; cut 2, square 1, level 4a.

Specimen 9 (Fig. 2D).—Tuber broken, compressed-spheroidal, the fragment 15 mm long, 11 mm wide and 10 mm thick. Skin wrinkled and rough. Surface features include one shallow eye, about 2.5 mm in diameter and about 0.5 mm deep, and place of stolon attachment. Skin color taupe brown (M. & P., 1950, Plate 16–A6). Interior of tuber hollow, containing many sand grains as well as clear crystals which arise beneath the skin and protrude into the cavity. Tuber weight 0.55 g. Provenience data: C3A–2 = 68 (1 of 2); cut 2, square 1, level 4b.

Specimen 10 (Fig. 2E).—Tuber flattened, broadly elliptical, 13 mm long, 12 mm wide and 7 mm thick. Skin wrinkled, rough, with a broken area of about 7 mm in diameter. Eyes and stolon attachment not evident. Skin color between rose grey and new cocoa (M. & P., 1950, Plate 7–A9). Interior of tuber crystalline, obsidian-like, appearing dark Pompeian red (M. & P., 1950, Plate 4–J10), the cells evident in scanning electron microscope (SEM) pictures (Fig. 4B, 4C). Starch grains broadly elliptical to ovate, staining darkly with iodine-potassium iodide solution and methylene blue, the largest 125 μm long. Tuber weight 0.65 g. Provenience data: C3A–2 = 68 (1 of 2); cut 2, square 1, level 4b.

Specimen 11 (Fig. 2F).—Tuber compressed-spheroidal, 15 mm long, 9 mm wide and 7 mm thick. Skin wrinkled, scab damaged and lacking an area of about 4 by 5 mm on one side. Surface features include 3 shallow eyes, each about 2.5 mm in diameter, and the place of stolon attachment. Skin color between rose grey and new cocoa (M. & P., 1950, Plate 7–A9). Starch grains broadly elliptical to ovate, darkly staining with iodine-potassium iodide solution and methylene blue, the largest 150 μm long. Tuber weight 0.51 g. Provenience data: C3A–2 = 68 (1 of 2); cut 2, square 1, level 4b.

Location C4.—Tortugas

This early Ceramic site lies on the coast north of Casma. Much of the site has been destroyed by modern construction, but an area of midden over a meter deep lies undisturbed and was sampled for the present study. On the basis of ceramics

and other artifacts, it is believed that Tortugas is contemporary with Pampa de las Llamas-Moxeke, and dates from the Initial Ceramic Period, about 1800–1500 B.C. As with the Huaynuma location, the samples from Tortugas are from different levels within a controlled stratigraphic excavation.

Preserved remains of the white potato, jicama and the sweet potato were retrieved from Tortugas. Tubers of the white potato are represented by the following collections:

Specimen 12 (Fig. 2L).—Half-tuber, the fragment compressed, possibly globoid when fresh, about 13 mm in diameter and 5 mm thick. Skin wrinkled, present on one side only. Surface features include 2 eyes, about 2 mm in diameter each, and about 1 mm deep. Place of stolon attachment not evident. Skin color clove brown (M. & P., 1950, Plate 16–A7). Interior of tuber hardened into a crystalline, obsidian-like mass, but appearing charred immediately below skin surface. Starch grains broadly elliptical to ovate, darkly staining with iodine-potassium iodide solution and methylene blue. Tuber fragment weight 0.21 g. Provenience data: C4A–2 = 39 (1 of 2); cut 2, square 1, level 4b.

Specimen 13 (Fig. 2M).—Two fragments from single tuber (broken in handling). One fragment 14 mm long, 11 mm wide and 5 mm thick; the other 13 mm long, 7 mm wide and 5 mm thick. Skin very wrinkled, damaged by scab (Fig. 4D) and encrusted with small white crystals. Skin color Madrid brown (M. & P., 1950, Plate 15–C10). Starch grains broadly elliptical to ovate, staining darkly with iodine-potassium iodide solution and methylene blue. Weight of fragments 0.35 g. Provenience data: C4A–2 = 50 (2 of 2); cut 2, square 1, level 5.

Specimen 14 (Fig. 2N).—Tuber flattened and concave on one surface, nearly orbicular, 15 mm long, 14 mm wide and 7 mm thick. Skin wrinkled, broken on one edge, encrusted in places with white crystals. Surface features include a single eye about 2 mm in diameter and the place of stolon attachment. Skin color kangaroo brown (M. & P., 1950, Plate 16–C6). Starch grains broadly elliptical to ovate, staining darkly with iodine-potassium iodide solution and methylene blue, the largest about 50 μ m long (Fig. 3D). Weight of tuber 0.66 g. Provenience data: C4A–2 = 50 (1 of 2); cut 2, square 1, level 5.

Specimen 15 (Fig. 2O).—Tuber fragment, very irregularly compressed-ellipsoid, 17 mm long, 13 mm wide and 7 mm thick. Skin wrinkled, without evident surface features. Skin color racquet brown (M. & P., 1950, Plate 15–C7). Interior charred. Fragment weight 0.71 g. Provenience data: C4A–2 = 50 (1 of 2); cut 2, square 1, level 5.

Specimen 16 (Fig. 2P).—Tuber flattened, chipped, near orbicular, about 9 mm in diameter and 5 mm thick. Skin wrinkled, broken and pitted in places, without evident surface features. Skin color sparrow brown (M. & P., 1950, Plate 15–C6). Interior of tuber amber-colored, crystallized. Tuber weight 0.22 g. Provenience data: C4A–2 = 50 (1 of 2); cut 2, square 1, level 5.

Specimen 17 (Fig. 2Q).—Tuber flattened, concave on both surfaces, irregularly orbicular, about 7 mm in diameter and 4 mm thick. Skin wrinkled, broken in places, encrusted with sand and other debris, and without evident surface features. Skin color sparrow brown (M. & P., 1950, Plate 15–C6). Interior of tuber amber-colored, crystallized. The weight of this smallest tuber in our collection is 0.15 g. Provenience data: C4A–2 = 50 (1 of 2); cut 2, square 1, level 5.

Specimen 18 (Fig. 4F).—One-half portion of tuber, compressed, irregularly elliptical, 19 mm long, 14 mm wide and 6 mm thick. Skin wrinkled, torn, without evident surface features, the color rose taupe (M. & P., 1950, Plate 16–A4). Cortex granular, embedded with grains of sand, debris and bits of wood charcoal. End of tuber broken and appearing squeezed open, exuding straight and curved crystals. Starch broadly elliptical to ovate, darkly staining with iodine-potassium iodide solution and methylene blue. Fragment weight 0.48 g. Provenience data: C4A–2 = 84, cut 2, square 1, level 8.

Location C5.—Las Haldas

This coastal site south of Casma covers about 40 ha. A large mound and plaza structure dominate the central area which is flanked by many other sizable

mounds and extensive areas of midden. The tuber samples described here are from a controlled stratigraphic excavation in the Initial Ceramic Period midden which overlies the Preceramic deposit and immediately predates the temple construction. Published C-14 dates for this zone of the Las Haldas midden are about 1600–1200 B.C. (Grieder, 1975; Matsuzawa, 1978).

Tubers of the white potato from this location include the following collections:

Specimen 19 (Fig. 2R).—Tuber flattened, irregularly concave and orbicular, about 18 mm in diameter and about 12 mm thick. Skin smooth in some places and wrinkled in others, dotted with crystalline encrustations about 0.5 mm in diameter. Surface features include 3 shallow eyes, about 3 by 6 mm in size, and place of stolon attachment. Skin color clove brown (M. & P., 1950, Plate 16–A7). Tuber weight 2.1 g. Provenience data: C5A–4 = 63; cut 4, square 1, level 6c.

Specimen 20 (Fig. 2S).—Tuber nearly globoid, about 8 mm in diameter and very brittle (broken in 2 pieces during handling). Skin wrinkled, cracked and granular, encrusted with crystals in places. Tuber lacking eyes but showing place of stolon attachment. Skin color clove brown (M. & P., 1950, Plate 16–A7). Starch grains broadly elliptic to ovate, staining darkly with iodine-potassium iodide solution and methylene blue. Tuber weight 0.25 g. Provenience data: C5A–4 = 94; cut 4, square 1, level 8.

Specimen 21 (Fig. 2T).—Tuber compressed ovoid and slightly concave on each side, 14 mm long, 12 mm wide and 9 mm thick. Skin wrinkled, much encrusted with sand grains and with a fragment of wood charcoal embedded on one side. Surface features include 4 shallow eyes, each about 3 mm in diameter, and the place of stolon attachment. The sockets of 2 eyes are embedded with clear, sharp pointed crystals of about 1–2 mm in length (Fig. 4E). Skin color rose taupe (M. & P., 1950, Plate 16–A4). Tuber weight 0.82 g. Provenience data: C5A–4 = 132; cut 4, square 1, level 12.

DISCUSSION

The generally excellent state of preservation of the potato tubers that are described here is probably due to the extreme aridity of the sites from which they were obtained. The Casma area, one of the driest along the coast, is classified as subtropical coastal desert (Tosi, 1960). According to ONERN (1972), this valley receives usually no more than 5 mm of rain a year, and has an average yearly temperature of about 18°C.

Currently, no modern collections of wild or cultivated potatoes are known from the coast near Casma or the lower reaches of the Valley. However, in the highland areas of the Department of Ancash all major horticultural groups of the cultivated potato are to be found plus a total of 8 diploid wild species, all of which may be gathered or harvested within a distance of 100 km from the city of Casma (Correll, 1962; Ochoa, 1962). While of course it can not be said for certain whether any of these exact varieties or species were present in the very arid Casma area during archaeological times, it would nevertheless seem quite likely that in the case of at least one species, *S. tuberosum*, growth in the river bottom may have been made possible through the deliberate and ingenious efforts of man, particularly with respect to artificial flooding.

Thus, according to Pozorski and Pozorski (1979), irrigation agriculture was practiced by the ancient inhabitants of the coastal valleys of north-central Peru from the early Initial Period onwards. The crops that were grown under irrigation in the valleys (and especially in the upper reaches of the valleys were the necessary canals for watering were more easily engineered and constructed) were regularly exchanged for marine products that formed the economy of the nearby

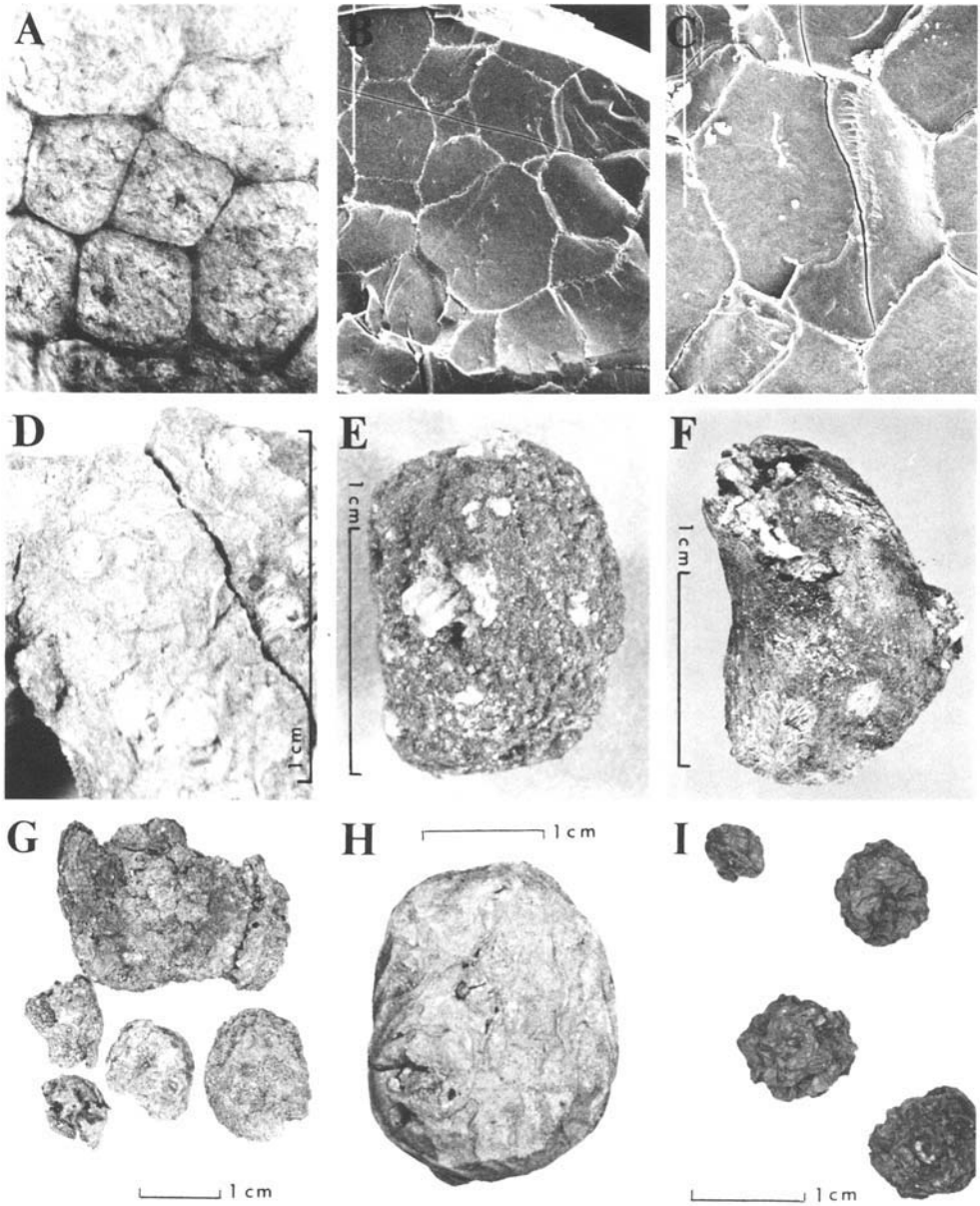


Fig. 4. Cells and morphological tuber characteristics of the potato. A. Phase contrast micrograph (160 \times) of the cortical cells of a preserved tuber from Pampa de las Llamas-Moxeke. B. Scanning electron micrograph showing the cell wall structure of the cortex of a tuber unearthed at Huaynuma (gold-palladium coated, 200 \times). C. SEM photo of a single tuber cortical cell, this hardened and cracked, from the Huaynuma collection (gold-palladium coated, 700 \times). D. Wrinkled, scab-damaged skin of a tuber (Specimen 2M) from the Tortugas collection. E. Crystalline areas on surface of a tuber (Specimen 21) unearthed at Las Haldas. F. Crystals on tuber fragment from Tortugas (Specimen 18). G. Tubers from Chilca Canyon. H. Tuber from Pachacamac. I. Dried, modern-day tubers of *S. tuberosum* Group Stenotomum (P.I. 365344).

downstream coastal sites. With respect to Casma Valley, it is believed that Pampa de las Llamas-Moxeke and Tortugas represented one such pair of symbiotic communities. However, even in Preceramic times, potatoes and other crops may have been grown seasonally in the Casma Valley along the river floodplain, quite possibly even by the people who resided as far north of the mouth of the river as those at Huaynuma. Initially, cultivation of the potato and other crops probably took place by the method of flood water farming, but by late Preceramic times experimentation with canals was probably well underway, and led eventually to full-scale irrigation farming.

With respect to the size of the tubers examined here, these are on the whole smaller than ones seen from Pachacamac or Chilca. Tubers collected by Uhle (Harshberger, 1898) at Pachacamac, for example, were said to be about 1 in (25.4 mm) in diameter. A single tuber with grey-colored skin (M. & P., 1950, Plate 15-C2) collected by Ugent at Pachacamac in 1973 measures 28 mm long, 21 mm wide and 15 mm thick (Fig. 4H). Starch grains from this tuber are broadly elliptical to ovate and resemble those of the modern potato, the grains from 2 horticultural groups of which are shown in Fig. 3E, 3F. In contrast, the average size of the tubers from the Casma area is 14.2 by 12.5 by 8.0 mm. These range from 8–23 mm in length to 8–22 mm in width, and from 4–12 mm in thickness.

A collection of 5 buff-colored tubers (M. & P., 1950, Plate 13-D7) from Chilca Canyon, presented to Ugent by Peruvian potato taxonomist Carlos Ochoa, is shown in Fig. 4G. These tubers, some of the oldest known to science (8000 B.C., *vide* Engel, 1970; Yen, 1974), range from 12–35 mm in length to 8 by 25 mm in width. The largest, a fragment of a whole tuber, is considerably larger than anything as yet seen from the Casma area. Moreover, the broadly elliptical to ovate starch grains from these tubers (Fig. 3I), while not well preserved, are more similar nevertheless to the grains of the modern cultivated potato than they are to the starch of the wild species, the latter (Fig. 3G, 3H) having long-pointed and often much smaller grains. This would suggest to us that the species *S. tuberosum* may have been under cultivation for at least 10,000 yr.

With regard to the probable original size of the tubers studied here, it is quite likely that these were of considerably larger dimensions when freshly harvested. From a study of the surface wrinkling of the Casma tubers, as well as from an examination of the modern-day dried and fresh tubers of the diploid *S. tuberosum* Group *Stenotomum* potatoes, which the former resemble in their overall dimensions (Fig. 4I), it is apparent to us that these tuber remains have lost at least 50% of their original fresh size, and probably up to 90% of their original weight.

Lastly, it must be mentioned that the occurrence of bits and pieces of wood charcoal embedded in the skin and interior cavities of some of the tubers described here, such as in Specimens 8, 18 and 21, together with the lack of pottery vessels at such Preceramic sites as Huaynuma, suggests that the mode of preparation of these tubers was by baking, possibly by placement along the edge of an open camp fire. Moreover, in some, as in Specimens 1, 3, 12 and 15, the cortex beneath the skin of the tuber appears scorched or charred, as if singed by fire.

In 2 cases, Specimens 7 and 8, the skin was absent, suggesting further that the tubers from the Casma area were sometimes eaten peeled, perhaps to get rid of the charred, ashy skin. However, more work needs to be done before additional comments can be made in this regard.

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