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AN EXPERIMENTAL UMU-TI

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From the abundance of large ovens in South Canterbury and Otago and the inferred use of these as ti (Cordyline australis) cooking ovens (see, for example, Knight, 1966), it is apparent that ti was an important carbohydrate source in the prehistoric Maori diet, at least in these areas (Leach, 1969).

The excavation at the Dart Bridge site (Anderson and Ritchie, 1981) revealed three large raised-rim pits. Two of these have been preliminarily interpreted as umu-ti. Because of the abundance of ti in the Dart Valley area and the availability of wood and suitable stones, it was decided to construct an umu-ti during the progress of the excavation.

Many accounts of the preparation and cooking of ti as well as oven construction were collected by Best (1976). With these accounts in mind, the oven was constructed considering the following points: pre-treatment of ti, cooking time and temperature, and post-cooking treatment.

Method

A search was made to obtain the youngest and smallest ti trees available as Best (1931:16) indicated that only roots and stems from young trees were eaten. However, it was not possible to obtain young trees because sheep destroy them. The ti stems and roots were cut into short lengths. The pieces were subjected to various pre-treatments: some had the bark removed and selected pieces with bark intact and removed were soaked in water for 24 hours. Other pieces with and without bark were pounded.

Quartz cobbles of about 10 cm diameter from the Dart River bed were selected as ovenstones. A hole of 1.1 m depth and 1.6 m diameter was dug and a single layer of stones was placed in the bottom. A Magonic/Brightray thermocouple sealed in a stainless steel tube was installed projecting from the oven wall into the centre of the pit to monitor the temperature in the stone area. The thermocouple system was checked for calibration before and after the experiment. This apparatus was used previously by Gillies (1979).

After the placing of the thermocouple, the pit was filled with wood and kindled. Stones were thrown into the pit when the wood was burning readily. The wood was allowed to burn for two hours heating the stones.

Bracken fern (Pteridium aquilinum var. esculentum) which had previously been soaked in water and Californian thistle (Cirsium arvense) were spread onto the hot stones. The ti roots and stems bundled as to pre-treatment were placed on top of the thistle and fern. Another thermocouple was placed in the cooking area. Approximately 20 litres of water were added followed by sacking to cover the ti bundles. The oven was then quickly covered with earth and topped off with turf to seal it (Plate 1). Temperatures were monitored throughout the cooking process. After 21 hours a small hole was made in the cone of earth and a bundle of ti removed. The oven was immediately resealed and cooking continued up to a total time of 47 hours. At that time the turf and earth covering the sacking were removed and the bundles of ti (now kauru) retrieved.

The cooked ti was pounded resulting in the farinaceous substance being easily released from the fibres. Agitating in water also released the starchy matter from the fibres. The product was then tasted.

The tops (undeveloped leaves) of the ti trees were cooked for four hours in a separate umu which was used for cooking food.

Observations and discussion

The maximum temperature attained by the fire was 498°C occurring 25 minutes after ignition (see Fig. 1). The temperature fell slowly to 200°C after 24 hours. On being opened after two days the oven rekindled by itself and was still 300°C 68 hours after the initial firing.

The temperature in the cooking area did not exceed 100°C until 5½ hours after being sealed (Fig. 1). Then the temperature rose surprisingly high to a maximum of 133°C and continued well above 100°C until the oven was opened to retrieve the first bundle of ti. At this time, as expected, the temperature fell below 100°C, but rose again to remain for the most part above 100°C until the oven was finally opened. It was expected that the temperature would remain at or slightly above 100°C. This is probably true for ovens used for cooking food such as meat and vegetables as discussed by Sutton (1971) and Gillies (1979). However, in an umu-ti the steam has a chance to become super-heated and this accounts for the breaking down of the ti glucofructan to monosaccharides with their sweet taste. Cooking times mentioned in the literature vary from 12 hours (Brunner, 195 :125), to 24 hours (Anon., n.d.:6), and up to two days (Best, 1931:16). The experimental oven maintained a high cooking temperature for two days and never ran out of steam, indicating that long cooking times are possible, and probably preferable for producing a sweeter product.

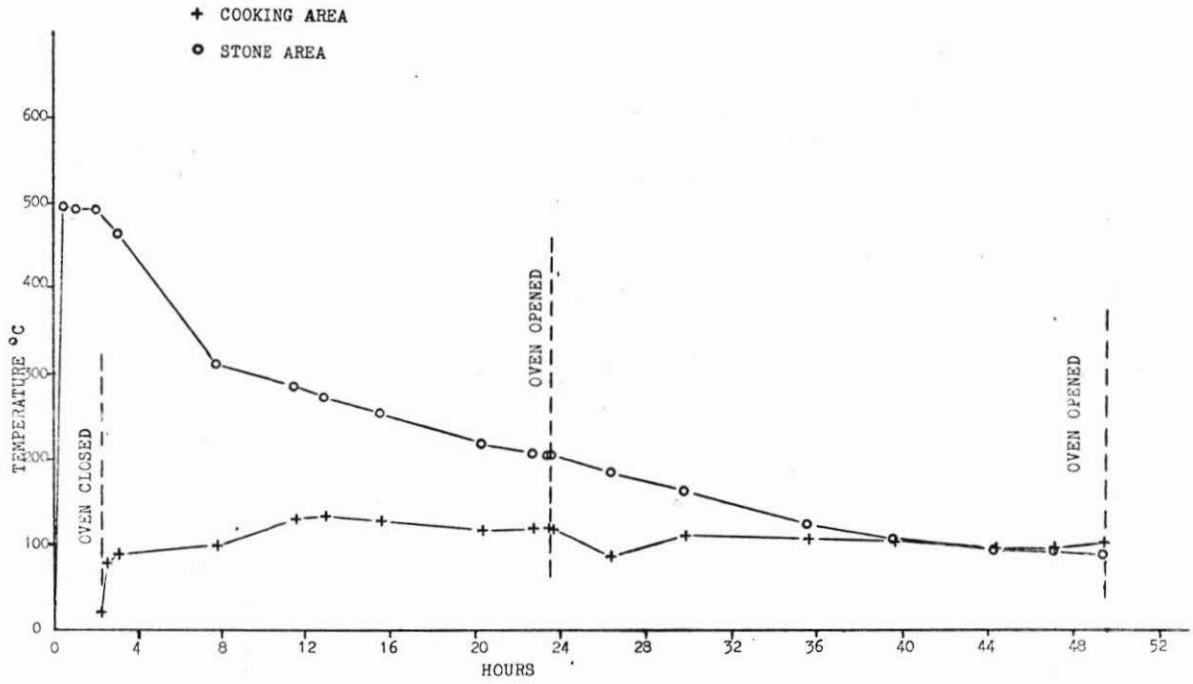

FIGURE 1. Umu-ti temperatures in the stone and cooking areas.

The kauru produced in this experiment had a somewhat bland taste. The lack of sweetness was most certainly due to the age and woody quality of the ti selected. The ti cooked for 47 hours was slightly sweeter than that cooked for 21 hours. The ti cooked without bark was sweeter and tasted differently to that with the bark intact. Before the experiment it was thought that the bark was removed to facilitate cooking. However, it is now evident that the bark imparts a bitterness to the kauru. Hence it would be removed before cooking even though it is more easily removed after steaming. It was noted by Best (1976:259) that only one species of Cordyline (ti para) in the North Island did not require removal of the bark. The farinaceous matter was more easily removed from those samples which had been soaked for 24 hours prior to cooking. Also, this soaking probably improves the conduction of heat to the center of the ti pieces. Pounding had no effect as a pre-treatment. Pounding was probably reserved only for roots of Cordyline terminalis (Walsh, 1900:304).

The cooked tops were tender with an agreeable taste absorbed from the surrounding food.

It was necessary to dry the cooked roots and stems carefully; otherwise they spoiled quickly. Prehistorically, ti was carefully dried and stored on elevated platforms (Anon., n.d.:5). Large quantities could be easily transported because of the light dry-weight.

Upon soaking in water the dried ti is almost instantly revived and can be pounded to remove the edible substance. Ti can be stored for long periods of time as long as it is kept dry (Best, 1976:270).

Conclusions

A successful experimental umu-ti was constructed yielding the following conclusions:

1. A temperature greater than 100°C was maintained in the steam area for two days.
2. Longer cooking times and bark removal result in a sweeter product.
3. There seems to be no reason to pound the ti before cooking. In fact, pounding has little effect on the ti stems and roots until after they are steamed.
4. If dried kauru is put into water it revives almost immediately with the edible matter being easily removed by pounding and agitating in water.
5. An umu-ti requires a source of water nearby to furnish water for steam.

6. It is necessary to dry the cooked ti immediately after cooking and keep it dry.
7. Kauru is easily transported after it has been dried.
8. Cooking the tops of the Cordyline australis plant would not be done in an umu-ti. The undeveloped leaves were very tender after cooking only four hours.
9. It became evident that raised-rims on umu-ti are not necessarily part of the construction, but result from uncovering the oven after cooking (see Plate 2).
10. Even after two days of being covered the unburned wood and charcoal reignited, giving an oven which looked very much like those encountered during excavation, i.e. stones and charcoal in tight assembly at the bottom of the pit. Deterioration of the oven set in quickly with the sides collapsing to partially cover the stones and charcoal.

The ti plant most certainly served as a convenient and an important food supply in times of food scarcity and for improving the taste of fern root.

Work is continuing at the University of Otago on the nutritional analysis of ti. Also, research is being conducted on the breakdown of polysaccharides with varying cooking times.

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UMU-TI Plate 1. Sealed *umu-ti* with thermocouple apparatus.

UMU-TI Plate 2. *Umu-ti* immediately after opening. Note the raised-rim resulting from uncovering oven.