

APPENDIX 3

ARCHAEOBOTANICAL STUDIES AT AND AROUND QALAT SAID AHMADAN

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The purpose of this archaeobotanical study at Qalat Said Ahmadan was to clarify how people subsisted at this site in the past. This study 1) sampled the plant remains from the site and identified the plant species; 2) undertook field observations of the current vegetation, identified the species present, highlighted possible plant uses and described the environmental features of the site. The following results were obtained:

1. Sampling of plant remains from Qalat Said Ahmadan

Plant remains collected at an archaeological site generally reveal the food eaten by ancient people, and charcoal remains enable us to reconstruct the past vegetation and the environment surrounding the site. The plant remains are basically charred by fire, and the non-charred materials have disappeared due to bacterial degradation.

Soil samples obtained from Qalat Said Ahmadan during the 2014 excavation season were subjected to water floatation (Fig. 1) and the charred remains were extracted (Fig. 2). A total of 71 L of soil from seven samples were collected from the Neolithic layers (Table 1). Only a small amount of charred remains was recovered, but some intact lentil and *Aegilops/Triticum* seeds were found. One bag of hand-picked charcoals was sampled from the lowest sediment during the 2014 excavation season. Microscopic analysis of the charred remains will be needed to identify the species present, and further study will be undertaken at Yamaguchi University, Japan.

2. Field plant observations

The following are the field trip notes. The plants listed here are the species found at the archaeological site. In summary, the investigation revealed that 1) the vegetation in the Qaladizah area (and probably in neighboring areas) is basically composed of gradually increasing numbers of individuals of a relatively fixed pool of species after the Holocene period; 2) some valuable genetic resources, including wild diploid and tetraploid wheats, have become endangered by human activities; and 3)

Table 1 Soil sample list for water-floatation at Qalat Said Ahmadan

Sample No.	Operation	Basket	Structure	Layer	Soil volume (L)
No. 1	B	58	5	4	5
No. 2	B	99	—	6	25
No. 3	B	44	4	3	15
No. 4	B	59	6	4	5
No. 5	B	68	Beside 8	4	5
No. 6	B	98	—	6	9
No. 7	B	67	9	4	7
No. 8	B	101	—	6	hand pick

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overgrazing by domestic animals has had significant effects. The plant species identified and the sites at which they were observed are listed below:

2014-9-25 From Qaladizah to southeast Qandawl.

@9-25-1

N36.05.611 E45.30.44 roadside

Aegilops (*Ae. triaristata*, *Ae. triuncialis* and *Ae. umberrata/geniculata*), *Hordeum vulgare* subsp. spontaneum, *H. bulbosum*, *Avena* sp., *Heteranthelium piliferum* and *Taeniatherum caput-medusae* were frequently observed at park forest of deciduous oak (*Quercus aegilops*). In addition, a number of mines left from the Iran-Iraq War were seen by signboards at this site.

@9-25-2

N36.04.611 E45.31.888 roadside, a north slope of a wadi

Deciduous oak, wild pistachio (*Pistacia eurycarpa*), *Salix* sp., and *Arundo/Phragmites*. Small plantation of grape where pomegranate and almond were also cultivated.

@9-25-3

About 200 m above from 9-25-2

Pistacia eurycarpa, roadside, was grown for resin extraction.

2014-9-27 Qandil valley, northwest of Qaladizah and north and east of Lake Dukan.

@9-27-1

N36.31.389 E45.00.611 (650 m) Entrance of Qandil valley, small wadi

Aegilops triaristata were seen. On the west slope, approx. 200 m from 9-27-1, large colonies of Compositae and *Avena* with *Hordeum vulgare* subsp. spontaneum, *H. bulbosum*, *Taeniatherum caput-medusae*, Apiaceae, and Caryophyllaceae were found.

@9-27-2

N36.10.444 E44.73.611 highway roadside, wheat and/or barley fields in front of deciduous-oak forest

Tetraploid wild wheats (*Triticum araraticum* and/or *T. dicoccoides*), *Aegilops comosa* and *Ae. umberrata/geniculata*. A hawthorn (*Crataegus azarolus*) tree was found in a two-rowed barley field on the west side of the highway. Very small lower ear spikelets with characteristic tip-end glume suggested that diploid wild wheat was present, but this must needs to be checked in future. East of the road, there were common wheat fields and deciduous-oak forest. The wheat field cuts into the forest, and the cultivated bread wheat and wild tetraploid wheat were grown side by side. The wild tetraploid wheat was growing widely over the hillside (Figs. 3, 4).

@9-27-3

N35.96.167 E44.99.833 eastern hill of Dukan, west slope

Deciduous-oak (*Quercus aegilops*) forest with stone partitions. Small numbers of tetraploid wild wheat were seen. They survive only along the stone walls, which clearly prevent invasion by herbivorous animals. *Aegilops triuncialis*, *Ae. umberrata*, *Avena* sp., and many species belonging to the genus *Brassica*, Apiaceae, and Leguminosae were seen. Dense stands exist where there was no animal predation (Fig. 5).

2014-9-28 Southeast of Lake Dukan.

@9-28-1

N35.99.972, E45.13.861 (1300 m) Hawara Barza village

About 200 m from the village, *Hordeum bulbosum*, *H. spontaneum*, and *Avena* sp. and Poaceae sp. appeared sporadically along the road. Spikes of *Aegilops triuncialis* on the slope below the road, as well as *H. bulbosum*, *H. spontaneum* and another *Hordeum* sp. were found at the



Fig. 1 Water floatation system to collect plant charred remain



Fig. 2 Charred plant remains recovered by water-floatation



Fig. 3 Wild wheat is endangered by human impacts



Fig. 4 A huge colony of wild tetraploid wheat (*Triticum araraticum*) (9-27-2)



Fig. 5 Overgrazing causes extinct of wild wheat; the wheat survives very limited place where animals do not enter (9-27-3)



Fig. 6 Okura cultivation and the view from Qalat Said Ahmadan (9-29-3)

entrance of the village. This village is the endpoint of the road and is located on a west-facing slope. Vineyards were spread across the village; many almond trees were planted along footpath; and orchard management was probably the main agricultural activity of this village. We found an individual wild tetraploid wheat growing in a nearby farmer's house, and *Ae. triuncialis* was found growing on the south-facing steep slope at the southern end of the village. The roadside slopes surrounding L. Dukan were often burned and black. The leaves of the oak trees were brown due to fire damage.

@9-28-2

N35.92, E45.11 (744 m) Qomirghan village

Hordeum vulgare subsp. *spontaneum* and *H. bulbosum* were observed along the wadi and the roadsides.

@9-28-3

N35.97.389, E45.04.805 (745 m) roadside near the junction leading to Slemani and Stuca villages. The soil was very dry, and contained plants that had adapted to these conditions, such as *Carthamus* sp. (Compositae) and *H. bulbosum*, *H. spontaneum*, and *Avena* sp. (Poaceae). Grazing by cows, sheep, and goats was severe and plants only survived along rock walls and between big rocks. Neither *Aegilops* nor *Triticum* species were observed.

2014–9–29 Vegetation found at Qalat Said Ahmadan.

@9–29–1

N36.22.472, E45.14.666 (706 m), top of the Tell

Prosopis (45%) and *Avena* (45%) were recorded in northwest parts of the area, *Centaurea* (70%), *Prosopis farcta* (20%), and *Glycyrrhiza glabra* (Liquorice) (5%) were recorded in the northeastern Tell (Qalat) area. In the other areas, the grasses were cut down to keep the area clean and were therefore not appropriate for floral observation.

Prosopis farcta; *Centaurea* sp.; *Carthamus* sp.; *Avena* sp.; *Glycyrrhiza glabra*; and some *Trifolium*, *Medicago*, and *Caryophyllaceae* spp. were common. *Hordeum vulgare* subsp. spontaneum, *Astragalus hamosus*, and *Brassica* sp. were also recorded.

@9–29–2

A small wadi, approx. 100 m south from Qalat Said Ahmadan

Prosopis farcta, *Aegilops triuncialis*, *Ae. umberrata*, *Avena* sp., and other species were recorded. A spring was seen approx. 50 m downstream of the wadi, and riparian plants such as *Arundo/Phragmites*, *Salix* sp., *Populus* sp., and *Rubus sanctus* were identified. On the bank of this spring, *Paliurus spina-christi*, which has a sharp spine, was found.

@9–29–3

Cultivation fields around Qalat Said Ahmadan

In summer, irrigation supports the growth of many different vegetables. Okura was the most cultivated vegetable in Said Ahmadan village. Tomato, eggplant, pimento, some squashes, minicelery, kidney bean, leek, and garlic chive were all cultivated in the small spaces next to the okura (Fig. 6).

Fruit production was one of the important economic sources of the village. Pomegranate, fig and grape were the main species, whereas walnut, almond, peach, quince, etc. were also grown.

Wheat and barley were the winter cereal crops. Fragments of wheat spikes, damaged by harvesting, suggested that they were of bread wheat (common wheat, hexaploid species). The cultivars were both awned and awnless. However all the kernels had a white seed color (*i.e.*, no red kernel was seen). Two and six-row barley were also recorded. According to a farmer, wheat here is sown in mid-November and harvested in mid-June.