

Correlation between the Characters of Vegetation and Desert Habitat in Tarim Basin, Xinjiang, China

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(Received on November 1, 1993)

In Tarim Basin, mesophytic and halo-tolerant plants are dominated along riverside or dry delta in isolated and azonal patterns. Vegetations composed of temperate deciduous broadleaved trees assemble closely, displaying xeromorphic and eremophytic landscape. They are adopted to very scarce and irregular rainfall to complete their life cycle. Therophytes are restricted to the region where stable water supply is available and most of them die in winter. No ephemeral plant is found since there is no winter snow nor spring rain. Many endemic species are reported from this area.

Nature Condition

Tarim Basin is situated at the latitude 37°–42°N, and is surrounded by Tianshan and Kunlun Mountain ranges, leaving a gap of about 70km in width on the east. Its total area is more than 400,000 km². The Tarim River flows from south to north in the west of the basin, and then turns eastward along the foot of Tianshan, forming an alluvial flatland of about 60–80km in width. The open area on the south of Tarim River plain is Taklamakan Desert. There are many small rivers such as Hetian and Cherchen Rivers etc. across the desert northward (Chin. Acad. Sci. Xinjiang 1978a).

As the Basin is far apart from the ocean and is enclosed by mountain ranges, its climate is extremely dry. Annual precipitation is 10–70mm decreasing gradually from west to east, as well as from edge to centre. It is less than 50mm in the central area. Humidity is about 10%, and 0% is recorded sometimes. Annual massa temperature ($\geq 10^{\circ}\text{C}$) is 4,000–4,400°C. Cloudy and rainy days are scarce. Annual

sunshine is about 2,800–3,300 hours, and the sunshine rate is 63–70%. Strong northwestern wind containing much dusts blows frequently (Pan and Huang 1989).

Vegetational Situation

According to Gausen-Water's diagram, Tarim climate belongs to the typical Mongolian type, characterized by higher atmospheric temperature and very poor and summer-confined annual precipitation. The annual thermal curve shows a single valley-peak (Fig. 1) (Chin. Acad. Sci. Xinjiang 1978b), and the organic materials of plants are accumulated in summer. Under this desert climate, the vegetation is mostly bush, semi-bush and small semi-bush, showing typical Central-Asian desert vegetation. The landscape is characterized by scarcity and poverty. According to our collection in these years, 168 species of seed plants, belonging to 108 genera and 38 families, were found from all over the desert.

No ground vegetation exists in Taklamakan Desert

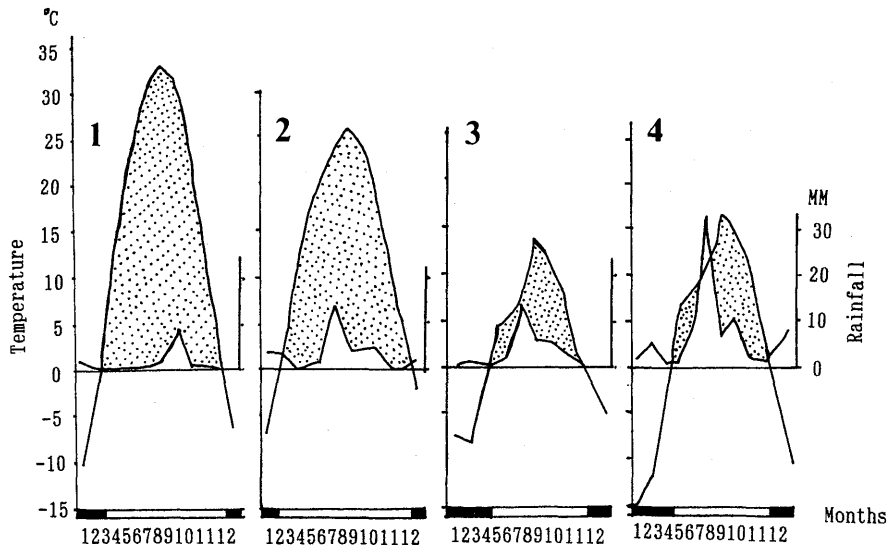


Fig. 1. The Tarim Climatic Types.

1. Tulufan (YAT = 14.0, ALT = -26.0, YR = 17.8)
2. Hetian (YAT = 11.9, ALT = -22.8, YR = 37.5)
3. Sailatu (YAT = 2.1, ALT = -22.5, YR = 31.0)
4. Tashkurgan (YAT = 2.7, ALT = -32.8, YR = 76.7)

YAT: Yearly average temperature (°C)

ALT: Absolute lowest temperature (°C)

YR: Yearly rainfall (mm)

except along the banks of Hetian, Cherchen and lot of other seasonal rivers. The riverside forest is dominated by euphrates poplar (*Populus euphratica*) (Figs. 3-1,2), gray poplar (*P. pruinosa*) and tamarisk bush (*Tamarix* spp.), and is accompanied with salt grassy marshland, forming so-called 'rimoff' vegetation or closed contracted vegetation. Sometimes, on the dried riverbed and delta there exists poplar and tamarisk coppice together with *Ephedra*. On the fringe of the desert, poplar and tamarisk coppice and reed-dune are occasionally scattered. On the northwest fringe, there are thickets composed of *Artemisia arenaria* and *A. sphaerocephala* and the halophytic community consists of *Haloxylon ammodendron*. As to the central part of the desert, no plant exists on the mobile luniform and pyramidal sand dunes, except for occasional tamarisk bush.

On the northwest and the north fringe of the

alluvial flatlands of Yerchiang and Tarim Rivers, there concentrated poplar (*Populus euphratica* and *P. pruinosa*) forest, tamarisk bush, reed (*Phragmites communis*) thicket, liman steppe composed of *Calamagrostis pseudophragmites*, and salt steppe dominated by *Glycyrrhiza inflata* and *Poacynum (Apocynum) hendersonii*. On the east part of the desert, there is Luobupe Lowland characterized by haloeremion salt desert, salt steppe, succulent salt tolerant bush desert and wind-eroded dunes, the famous "Yadan" geomorphological type. On the south fringe, there is a range of alluvial delta, among studied oases, occupied by two types of salt steppe. One is dominated by poplar coppice, tamarisk bush and *Halostachys belangeriana*, and another is composed of reed, *Poacynum hendersonii*, *Karelinia carpica* and *Alhagi sparsifolia*.

On the fringe of the desert, where exists flood-

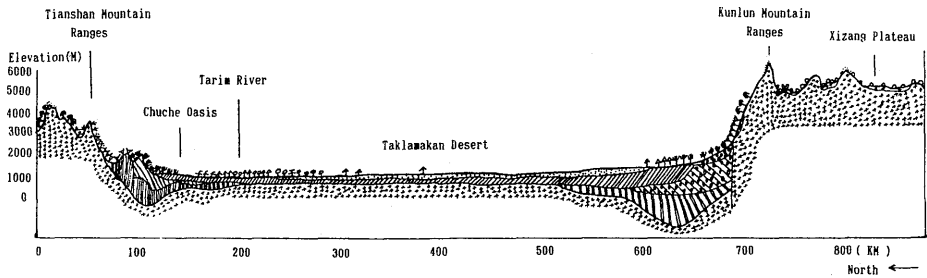


Fig. 2. The Cut Plane of Vegetation in Tarim Basin (along 83°E). Ⓐ Alpine mattae Ⓒ Zone of eternal snow Ⓓ Alpine *Kobresia* grassland Ⓔ Subalpine prairie Ⓕ Mountains region of desert prairie Ⓖ *Artemisia* spp. desert Ⓗ *Reaumuria* spp. desert Ⓘ *Anabasis* spp. desert Ⓚ *Ephedra* spp. desert Ⓛ *Halimodendron halodendron* desert Ⓜ *Haloxylon ammodendron* desert Ⓨ *Populus pruinosa* forest Ⓩ *Tamarix* spp. bush ⓐ *Populus pruinosa* forest ⓑ Thin *Phragmites communis* thicket ⓓ *Sympegma regelii* desert ⓔ Alpine cold desert. Bedrock and bedmatter: ⓕ Wind accumulated sand ⓖ Flood alluvial tiny soil ⓗ Flood alluvial gravel Ⓢ Grit and mudstone Ⓣ Mesozoic Era rock stratum Ⓤ The Palaeozoic Era rock stratum

alluvial fan of coarse gravelly talus, there dominated by *Ephedra przewalskii*, *Nitraria sphaerocarpa*, *Zygophyllum xanthoxylon*, *Z. kaschgaricum*, *Gymnocarpus przewalskii* etc., forming super-xerophytic consociations scattered on the desert communities.

On the lower part of sandy flood-alluvial fan, there exists *Calligonum* communities. On the flood-alluvial fan of north slope of Kunlun and south slope of Tianshan Mountain ranges, there exists small semi-bush and halophilous bush desert dominated by *Reaumuria soongarica*, *R. kaschgarica*, *Sympegma regelii*, *Anabasis truncata*, *A. aphylla*, *Arthrophytum balch* etc. Each of these species forms many consociations, but the coverage is quite low (Hu 1992).

Characteristics of Vegetation

(I) The vegetation in Tarim Basin is a runoff-vegetation (Huang 1986) with very simple structure.

(II) Component species is scarce in number. They are adopted to very poor and irregular rainfall to complete their life cycle (Pan and Chang 1993).

(III) Nearly no ephemeral plant is found in Taklamakan Desert since there is no winter snow nor

spring rain.

(IV) A considerable number of endemic species is reported from Taklamakan Desert. For example, *Reaumuria kaschgarica*, *Zygophyllum sinkiangensis*, *Myricaria pulcherrima*, *Ammopiptanthus nanus*, *Tamarix taklamakanensis* and *Calligonum roborowskii*. Most of them are confined to limited area and are oligotypic. It seems that they are relics of Tertiary period.

Vegetation in Tarim Basin is schematized in Fig. 2.

Correlation between the Vegetation and the Habitat

(I) Because of poor and irregular precipitation in time and place, vegetation is not well developed and mobile sand aggravate the situation (Fig. 3-3).

(II) Since the shortage and instability of water supply, plants sprout with surface runoff and complete their life cycle by the underground water which gives a correlation between the vegetation and the desert habitat.

(III) The severe habitat resulted the poverty and scarcity of flora and vegetation. The density coefficient is only 0.0024.

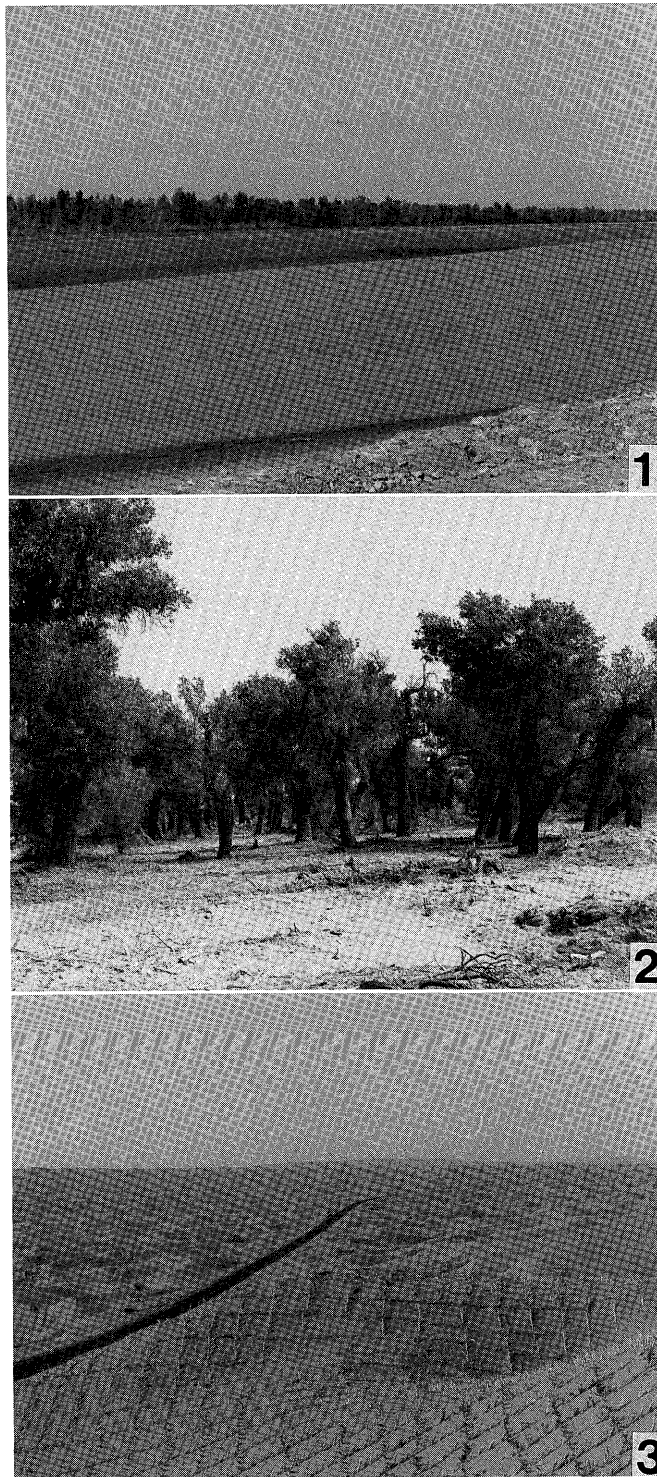


Fig. 3. 1: Forest along the bank of Tarim River. 2: Euphrates poplar (*Populus euphratica*) on the dry riverbed in Tarim Basin. 3: Endless Taklamakan Desert. (Desert road and nets of fixing sand)

(IV) No ephemeral plant is found from Taklamakan Desert. This phenomenon is different from other temperate desert, and also much different from Zhungeer Basin situated on the north slope of Tianshan Mountain range, where the vegetation is not an assembled type, and the ephemeral plants usually form a prominent seasonal aspect (Pan and Chang 1994).

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潘 曉玲, 張 宏達 : 中国タリム盆地の植生と立地の関係

タリム盆地の植生は中生か好塩性の温帯性落葉樹より成り、水辺か干上がったデルタに非帯状に点在する。これらは降水が不定期しかも非常に少ない中で生活環を全うするように適応している。

草本類は水の供給が常に得られる所に限られ、冬にはほとんどが枯死する。冬の雪や春雨がないため、早春性の短期草本は見られない。固有種はかなり多い。