# Native Plant Resources and Garden Landscaping in Longnan of Gansu Province

**Quan LIU[1]*, Zhanpeng LI[1], Xiaolin LI[1], Huili YAN[1], Hong LIU[2]**

1. Walnut Industry Development Center of Wudu District, Longnan 746000, China; 2. Luotang Forest Farm of Wudu District, Longnan 746000, China

**Abstract** Qinba Mountain Area is rich in plant resources. It is of great significance to study how to combine arbors, shrubs, and herbs in different regions and different climatic regions, reflect the beauty of color, form, and charm. Besides, under different climatic and geomorphological conditions, adopting different land preparation methods and different cultivation techniques is helpful for increasing the survival rate and preservation rate, so as to provide certain technical basis for revitalizing development of rural areas and building the ecological barriers.

**Key words** Western plants, Reasonable combination, Cultivation techniques

## 1 Introduction

In the western region of China, various landforms are mixed, such as the Loess Plateau and hills, mountain gorges and. Especially in the Qinba Mountains (southern Gansu and Shaanxi Qinling, Sichuan Daba Mountains), the valleys are intertwined, the peaks and ridges rise one after another, the terrain is highly different, and the terrain changes are complex. The climate can be divided into two categories: temperate semi-humid and subtropical humid climate. It forms a "biological resource bank" with a variety of plants, such as east-west transition, north-south transition, complex fauna and diverse species. According to statistics, there are more than 4 000 species of seed plants in Qinba Mountain, including about 300 species of ferns, mosses and lichens, and more than 60 kinds of useful fungi[1]. Among them, there are 123 species of 561 genera and 123 species distributed in Xiaolong Mountain areas, involving more than 20 kinds of plants and 469 kinds of medicinal plants that are under state protection of express provisions[2]. Plants distributed in Yuhe Conservation Zone include 1 395 species of 125 families and 625 genera of angiosperms, 6 families, 17 genera and 31 species of gymnosperms, 127 species of 28 families and 53 genera of ferns[3]. There are 1 000 species of flower plants, including 44 species that have prospects of utilization[6]. The forest types in Qinba Mountains mainly include *Picea asperata* forest, *Abies fabri* forest, *Larix gmelinii* forest, *Pinus tabuliformis* forest, *Pinus armandii* forest, *Pinus bungeana* forest, *Platycladus orientalis* forest, *Juniperus chinensis* forest, *Quercus yunnanensis* forest, deciduous oak forest, broad-leaved mixed forest, oak pine forest, poplar-birch forest, *Betula albo-sinensis* forest, *Betula platyphylla* forest, *Cunninghamia Lanceolata* forest, *Pterocarya stenoptera* forest, *Castanea seguinii* forest, *Toxicodendron verniciflnum* forest, *Salix cupularis* forest, *Rhododendron lapponicum* forest, *Hippophae rhamnoides* forest. In the plantation forests, there are timber forests, shelter forests, fuel forests[4]. In economic forests, walnuts, *Zanthoxylum bungeanum* and olives have become an industry helping poor people in Qinba Mountains to get rid of poverty. In recent years, with the development of the western region and the implementation of the rural revitalization strategy, it is necessary to study how to use the native unique plant resources to avoid planting southern trees in northern region or planting northern trees in southern regions, introduce plants as supplementary ecological barrier, such plants are main plants for building beautiful western regions. How to make plant combination in different regions under different topographic conditions? Sun Xiang *et al.* analyzed the application of native plants in urban landscape and greening (*South China Agriculture*, Issue 7 of 2016). However, there is no other study concerning the rural beautification in western region. In recent decades, through simultaneous introduction and selection, we have carried out landscape research on the use of native plants in different areas of Longnan.

## 2 Principles for plant selection

(i) The principle of suitable area, suitable tree, and suitable growth; (ii) The principle of integrating landscape with natural environment; (iii) The principle of matching arbors, shrubs, and herbs, and combining evergreen and deciduous trees; (iv) The principle of combining ecological and economic benefits; (v) The principle of orderly dense and sparse distribution, reasonably dense planting, attaching importance to the change of canopy line and the overall color block, interspersed with large arbors or large shrubs, and showing the effect in a short term[5]; (vi) The principle of reflecting the beauty of plant color, form, and charm; (vii) The principle of local residents loving and being glad to accept; (viii) The principle of integration with other water scenery roads, terrain, and buildings.

## 3 Selection of main native plants for different areas

**3.1 Selection of plants for humid areas** (i) Low-altitude valley areas (altitude of 660 – 1 500 m). The areas with rainfall

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* Corresponding author. E-mail: 3360333080@qq.com

of 600 – 900 mm and should select bamboo, palm, Chinese pistache, peach, apricot, persimmon, plantain, four-season flowers, calamus, Chinese flowering crabapple, Chinese sweet gum, *Acer mono* Maxim, *Pinus armandii*, birch, eucalyptus, *Toxicodendron verniciflnum*, maple, poplar, willow, ground cover plants and ferns. (ii) Half mountain humid areas (altitude of 1 500 – 2 500 m). The areas with rainfall of 600 – 900 mm and should select spruce, larch, Chinese pine, mountain peach, apricot, poplar[9], willow, birch, sea buckthorn, big hazelnut, *Pinus armandii*, *Spiraea hypericifolia*, *Dianthus chinensis*, Shamrock, *Magnolia officinalis* Rehd. et Wils, Manglietia fordiana, Magnolia sargentiana Rehd. et Wils., *Davidia involucrata*, *Metasequoia glyptostroboides*, and *Picea neoveitchii*[8]. (iii) High and cold humid areas (altitude of 2 500 – 3 000 m). The areas with rainfall of 600 – 900 mm should select spruce, fir, larch, willow, poplar, sea buckthorn, big hazelnut, apricot, and pine.

**3.2 Selection of plants for arid areas** Areas with rainfall of 450 mm should select *Lycium chinense*, *Jasminum nudiflorum*, *Incarvillea sinensis*, *Ruthenian medic*, Chinese pine, *Pinus armandii*, *Platycladus orientalis*, apricot, peach, sea buckthorn, *Zanthoxylum bungeanum*, Shamrock, *Ginkgo biloba*, *Althaea rosea*, *Iris lactea*, and four-season flowers.

## 4 Combination of plants for different regions

**4.1 Areas with altitude of 660 – 1 000 m** These areas have rainfall of 600 – 900 mm, the humidity is higher than 65% (sunshine hours of sunny and shady slopes). Thus, it is recommended to combine plants according to different landforms and environment.

(i) Within villages: *Musa basjoo*, *Trachycarpus fortunei*, *Neosinocalamus affinis*, *Phyllostachys sulphurea*, persimmon, walnut, *Liquidambar formosana*, *Pinus armandii*, *Acer mono* Maxim, ground cover Shamrock and different colored leaf shrubs. (ii) Beside the stream: willow, poplar, mountain peach, apricot, bamboo, rose, Chinese rose, *Belamcanda chinensis*, *Lycoris radiata*, and *Liquidambar formosana*. (iii) Cliffs: vines, such as *Jasminum nudiflorum*, mountain peach, apricot, and *Pinus armandii*. (iv) Hillside greening: tea, *Quercus dentata*, *Liquidambar formosana*, lacquer, Chinese toon, *Pinus armandii*, *Acer mono* Maxim, Tilia tuan, and birch. (v) Leisure area: *Bupleurum chinense*, *Taraxacum mongolicum*, *Lxeris polycephala*, *Althaea rosea*, *Plantago asiatica*.

**4.2 Areas with altitude of 1 100 – 1 500 m** These areas have rainfall of 450 – 650 mm and humidity less than 65%, and should select following plants.

(i) Within villages: peach, apricot, plum, palm, maple, *Acer saccharum*, *Cinnamomum camphora*, bamboo, cherry, *Lagerstroemia indica*, ginkgo, walnut, and olive. (ii) Beside the stream: willow, poplar, and bamboo, *etc.* (iii) Cliffs: vines, such as *Jasminum nudiflorum*, mountain peach, apricot, *Pinus armandii*, *Platycladus orientalis*, *Lycium chinense*, *Lilium pumilum*, and *Lilium brownii*. (iv) Hillside: *Robinia pseudoacacia*, *Amorpha fruticosa*, *Robinia pseudoacacia*, *Lycium chinense*, *Corylus heterophylla*, and *Cotinus coggygria*.

Herbs: chrysanthemum, *Belamcanda chinensis*, *Berberis pruinosa*.

Hillside green arbors: *Pinus tabuliformis*, *Robinia pseudoacacia*, *Platycladus orientalis*, *Olea europaea*, *Amygdalus davidiana*, *Armeniaca sibirica*, *Toxicodendron vernicifera*, *Toona sinensis*, *Fagus sylvatoca*, *Ulmus pumila*, *Sophora japonica*, and *Ginkgo biloba*.

## 5 Land preparation and cultivation

**5.1 Land types** Taking the watershed ecosystem coupled with the water system and geomorphology unit as the carrier and taking meeting the ecological needs of each tree species and realizing optimal growth and survival as the objectives, Qinba Mountain areas are dominated by the iron wet leaching soil, the site is a shallow ditch with valleys facing each other, a thin layer of soil on steep slopes, combined with a bare rocky land, a gentle slope, an iron-concentrated man-made paddy soil, a river land, a terrace land, a ditch land, and a gravel beach land[7].

**5.2 Land preparation and cultivation**

**5.2.1** Land preparation. Land is prepared according to the topography and geomorphology, and at the point of reference point as a unified point of view, the line is fixed and fish scale pit and water platform are designed. After the land is prepared, the fertility is determined on the basis of the soil density and thickness. Ratio of depth, width, and fertilizers is determined accordingly.

**5.2.2** Excavation of pits for field planting, that is, tree-planting pits with a depth of 100 cm and a width of about 50 cm.

**5.2.3** Determination of the cultivation method. Cultivation in extremely arid soil in barren mountains: (a) Excavate a tree-planting pit with a width of 1 m and backfill the mellow soil and fertilizer to 30 cm After watering and infiltration, cover the soil with 10 cm of mellow soil and reserve the mellow soil for planting trees. (b) Select an acceptable and strong seedling, and plant the mellow soil by the method of "three times of burying, two times of stepping, and one time of lifting the seedlings up" to plant the seedlings, and then water to fix the root. After the water is infiltrated, cover the soil to the neck of seedling root, then place a piece of 1.2 m plastic film to keep moisture and temperature, gather rainwater and also realize weeding.

If there is rural hardened road take it as a rain collection site, and make some water facilities such as water cellar and water pools on the basis of the terrain for irrigation.

For the area with extremely poor terrain, too thin soil layer and arid climate, difficult for watering and collecting rain, after selecting the visual midline, fix the point along the line, excavate a tree-planting pit according to the fish scale pit, and pad the plastic film at the bottom of the pit, and pad the thin straw and fine soil for planting. For the area with difficulty of transporting water, use 1 kg of glass container to fill the water, and put one or

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for the survival and development of rooftop farms, and provide a guarantee for the sustainable development of urban rooftop farms.

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several roots of the planted tree into the bottle. After planting, pad the plastic film to collect rainwater, and place the container to supply water slowly. For areas with good economic conditions and thick soil area, use water-permeable bags and water-retaining agents, to increase the survival rate.

**5.3 Nurturing and management** Each year, conduct 3 – 4 times of cultivation and weeding, fertilization and irrigation, and determine the amount of fertilizer and water randomly according to soil conditions and water content.

## 6 Discussions

**6.1 Survival rate** The survival rate is affected by various factors such as topography, climate, planting and nurturing, and the differences are too large. Apart from being influenced by the superiors, the western native plants are also affected by the gradual maturity of domestication and breeding techniques. Therefore, in the process of selecting plant varieties, it is necessary to select the domesticated varieties, and the survival rate of local breeding can be high, and vice versa. After the plant variety is selected, plus the correct land preparation method and the necessary nurturing and management, the survival rate and preservation rate will be high.

**6.2 Cultivation costs** Due to the combination of arbors, shrubs and herbs, the planting should be carried out on the principle of having landscape in four seasons and combination of 3 – 5 species. The construction should be carried out in accordance with the landscape requirements. The costs at early stage are higher than transplanting costs with ordinary functions, but there are few changes in late replanting. Comparatively, except the early stage costs, other costs are basically the same.

**6.3 Landscape effect** Since it is suitable for the selection of plant varieties, it is coordinated with the natural environment, concentrated on the formation of the ecosystem, takes advantages of changes in trunks, leaves, and flowers of plants, and combines the natural environment and living environment, so as to create the pure natural landscape effect that landscape changes with the environment and shape, and unite the man and nature.

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