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Growth Characteristics of Two Promising Tree Species for Afforestation, Birch and Larch in the Northeastern Part of Asia

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Abstract

Re-vegetation is urgently needed to increase the carbon sink for moderating atmospheric CO_2 by forest ecosystem, especially northeastern part of Asia with large population. We partly plant fast-growing species, such as birch (*Betula* spp.), larch (*Larix* spp.) and poplar (*Populus* spp.) in northeastern China. Especially, birch species are used for sap production; larch and its hybrid (F_1) are promising species for timber production and increasing the carbon sink. For understanding these afforestation materials, we review the distribution of birch and larch species in China and northern Japan. They have deciduous leaf habit and typical light-demanding traits and are found in cool temperate climate regions. They can survive in infertile soil conditions and withstand drought even in the steeper slop. Both genera are considered as pioneer of secondary vegetation after disturbances. We mainly discuss on the growth habitat of birch and larch from the view point of taxonomy and their distribution, expecting to give some guidance for the potential plantation place of the two genera.

Key words: birch, larch, distribution, re-vegetation, northeast Asia

Introduction

Re-vegetation is urgently needed to increase the carbon sink for moderating atmospheric CO_2. For this goal, we should know the candidate tree species as for afforestation materials with fast growth traits and high specific gravity of woody organs. Indeed, great energy demands due to rapid economic growth, industrialization and urbanization, which cause an increase of atmospheric CO_2 concentration, nitrogen deposition and atmospheric O_3 concentration. Moreover, global annual temperature has been continuously increasing since the Industrial Revolution (Galloway et al. 2004, Naja and Akimoto 2004). The physical environment surrounding the biosphere has been dramatically changed worldwide. Unfortunately, climate changes have been predicted to become more serious in near future (e.g. Roberts 1984, Strain 1985). For re-vegetation, we prefer to plant fast-growing species with high specific gravity (Cheng 2007, Deng et al. 2009, Koike et al. 2000, Ryu et al. 2009), therefore, increasing attention has been paid to larch and birch, and also to the potential region for the species to grow in China (Zhang 2000) and northern Japan (Koike *et al*. 2000).

For the successful afforestation and reforestation, we need basic understanding of some fast growing species, such as larch and birch. In this review, we focus on the distribution characteristics of birch (genus *Betula* L.) and larch (genus *Larix* Mill.) respectively in China and Japan. We firstly described their taxonomic and breeding efforts in these two species, and secondly showed their unique distribution characteristics for the understanding of potential capacity of these two genera as afforestation materials. For birch, especially, we also discussed their distribution in China and Japan for expecting future possible places of tree sap production (Mao *et al*. 2010, Terazawa 2005). On the other hand, we also give an idea of larch as a promising species for afforestation, the hybrid larch: F_1 (Ryu *et al*. 2009). We try to show a general idea of reforestation about the two genera in northeast Asia.

Taxonomic traite of birch

Scientists have studied birch on morphological, ecophysiological, taxonomical, evolution and distribution. Of course, they monitored the responses and resistance of birch to atrocious environmental stresses or extreme field conditions.

Betulaceae contains 6 genera, namely *Alnus*, *Betula*, *Corylus*, *Ostryopsis*, *Carpinus* and *Ostrya*. The genus *Betula* L. concludes 49 species and is divided into 2 sections: Sect. *Betulaster* and Sect. *Betula* (Chen 1994, Jiang 1990, Tabata 1964, 1966, Zheng 1983). Again, the growth characteristics of birch species are as follows: deciduous trees or shrubs; catkin flowers; monoecious; anemophilous; strobiles cylindric or oblong; minute nutlet ordinarily with membranous wings. It is known that genus *Betula* L. can survive in marsh, desert, salty, infertile and acid soil and have strong tolerance to drought, waterlog and cold weather. Some of this species specialized as bushy (Guan 1998, Hong *et al*. 2002).

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Geographic distribution of birch

Birch species distribute mainly in the northern temperate hemisphere or tropical higher mountains, partly exist in Latin America extending from Mexico to northern part of Argentina (Santala and Ryser 2009, Tabata 1966, Zheng 1983).

In China

Two sections exist in China: (1) Sect. *Betula* and (2) Sect. *Betulaster* (Spach) Regel, totally 31 species distributed all through the whole country as shown in Figure 1 and Table 1.

The "*Betula*" section is subdivided into 5 sub-sections : Subsect. *Betula* (5 species); Subsect. *Dahuricae* Regel (1 species); Subsect. *Costatae* Regel (6 species); Subsect. *Fruticosae* Regel (6 species) and Subsect. *Chinenses* Schneid (9 species) (Jiang 1990, Zheng 1983, Chen 1994). Section *Betulaster* has 4 species. There are totally 31 species growing in China, and dominate most of the mountains.

From a horizontal view, in China, birches distribute continuously from the Hengduan Mountains to Qingzang Altiplano, especially *Betula alnoides*, and

Fig. 1. Distribution of section and subsection of birch in China (after Jiang 1990).

Table 1. Birch species exist in China

Section	*Betulaster*	*Betula*				
		Sub. *Betula*	Sub. *Dahuricae*	Sub. *Costatae*	Sub. *Fruticosae*	Sub. *Chinenses*
Species	*B. alnoides*	*B. platyphylla*		*B. jinpingensis*	*B. gmelinii*	*B. gynoterminalis*
	B. *rhombibracteata*	*B. pendula*		*B. utilis*	*B.middendorfii*	*B. insignis*
	B. cylindrostachya	*B. halophila* .		*B. albo-sinensis*	*B. fruticosa*	*B. delavayi*
	B. luminifera	*B. tianschnica*		*B.austro-sinensis*	*B. coalifolia* .	*B. bomiensis*
		B. microphylla	*B. dahurica*	*B. ermanii*	*B. rotundifolia*	*B. potaninii*
				B. costata	*B. humilis*	*B. calcicola*
						B. jiulungensis
						B. chinensis
						B. schmidtii

then extend to the Qinling Mountains or the eastern parts to the Tianshan Mountains and the Altai Mountains. *Betula delavayi* evolves to form as western distribution range (Guan 1998, Jiang 1990, Kambiu Liu 1988). At the same time, birches also vegetate from the Taihang Mountains to the Daxing'anling Mountains and the Xiaoxing'anling Mountains, especially *Betula platyphylla* Suk. mainly forms the secondary forests in Northeast China (Zhao *et al*. 2010).

From a vertical view, birches can be found around height 600–1200 m in 52°N latitude, and also can be found around 1500–2000 m in elevation of 41°N latitude. At about 30°N latitude, birches can grow at 2500–4000 m elevation, for example, white birch is one of the widest dominate species. (Fig. 2). In temperate grass-forest region (47°N, 124°E), their distribution altitude is around 700–1000 m. Birches also can grow in tropical high mountainous, such as *Betula alnoides* can grow at southern Yunnan province (the Hengduan Mountains) and around 900 m elevation of (Mount. Everest) in Tibet.

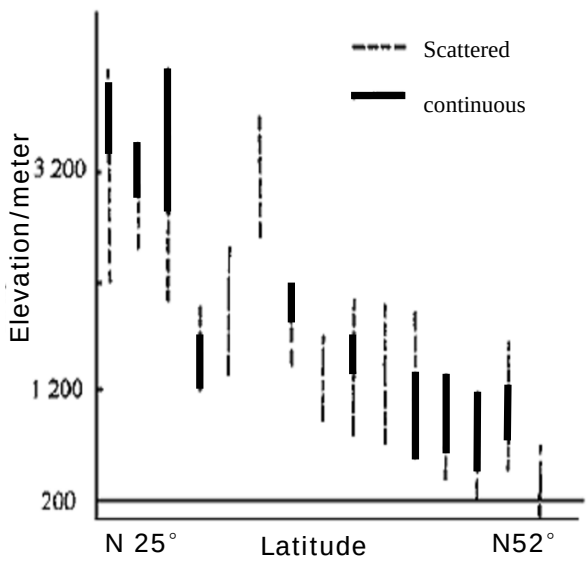

Fig. 2. Vertical distribution of communities dominated by white birch in China (adopted from Guan 1998).

Most of the scientists prove that the southwestern China suggests being the original place of genus *Betula* of China (Chen 1994). This region locates in the connection frontier of the Gondwana land and the Laurasia land, and has extremely long history of geology, and conserves numerous species of plants including plants of high elevation tropical mountains, semi-tropical plants, temperate plants and boreal plants. Sixteen species grow in southwestern China, more than half of the 31 species growing in China. In addition, ten species (stand for four subsections) can only grow in southwestern China. They include the most primordial genus in Betulaceae, Subsection *Betulaster* (Spach) Regel as well as the evolved Subsection *Costatae* Regel and Subsection *Chinenses* Schmeid species.

Another important distribution area of birch locates in northeast China, i.e. Daxing'anling Mountains, Xiaoxing'anling Mountains and Changbai Mountains. Ten species inhabit in northeast China, most of them are involved species, such as Subsect *Costatae* Regel and Subsection *Fruticosae* Regel (Jiang 1990). This may indicate that the northeastern part is the second natural forest distribution center; though some of the fossil seeds were found. Jiang (1990) deduced the fossil seeds may be caused by the glacier. Moreover he insists that the genus *Betula* originated from southwestern China, then dispread and evolved through all of the China.

Birch is an active pioneer species that can survive in severe environment: usually acts as the timberline plants at high mountains, seacoast, dry area or boreal region. For instance, *Betula ermanii* develops along the seacoast timberline with cool climate and alpine timberline in the Pacific Ocean seashores (Guan 1998, Koike 1995). Sometimes birches are mixed with larch, fir or grass in a forest instead of pure forest (Deng *et al*. 2009, Koike *et al*. 2000, 2007, and Xiao *et al*. 2002). Especially in the forest site destroyed by fires, snow or flooding, birch can regenerate or invade at the first time. The genus of *Betula* plays as extra-zonal vegetation, they can adapt to the swamp or well irrigated river bank, such as *B. fruticosa* Pall. Therefore, birch is an active species in stagger geographic region and can grow in the intergraded region between taiga and broadleaf forests (Shi *et al*. 2010).

In Japan

The genus "*Betula*" in Japan consists of two sections (e.g. Tabata 1966): Sect. *Betulaster* and Sect. *Eubetula*. The former section consists of the subsection *Acuminatae* (1 species) and the latter one, Sect. *Eubetula* (11 sp.) is subdivided into 3 subsections: Subsect. *Costatae* (7 species), Subsect. *Albae* (2 species) and Subsect. *Nanae* (2 species).

Totally 12 species are growing in Japan. Subsect. *Costatae*: *B. corylifolia*, *B. ermanii*, *B. nikoensis*, *B. schmidtii*, *B. globispica*, *B. grossa*, *B. chichibuensis*. Subsect. *Albae*: *B. platyphylla* var. *japonica* and *B. davurica*, Subsect. *Nanae*: *B. apoiensis* and *B. tatewakiana*. Subsect. *Acuminatae*: *B. maximowicziana* (Tabata 1966).

Monarch birch: *B. maximowicziana* Regel distributes wide range in Japan, extending from central Honshu to northern Japan (Tabata 1964). Seven species of Subsection *Costatae* spread among mountains and valleys. In this Subsection, most of the species can form forest as tree, except *B. chichibuensis* Hara is a shrub.

Subsect. *Albae* usually forms pure forests. White birch (*B platyphylla* var. *japonica* Hara) is widely distributed and acclimating itself well, its distribution range covers from central Honshu to Far Eastern Asia (including Siberia) (Koike 1995, Shi *et al*. 2010). Moreover, this species exists under various conditions, having a strong tendency to form a pure birch forest. White birch is well used in several regions of Hokkaido (Terazawa 2005) as well as in Russia (Zyryanova *et al*.

2010). Serial products of white birch were produced, such as tree sap, cake, tea, artificial ornaments and so on. Subsect. *Nanae* contains *B. apoiensis* Nakai and *B. tatewakiana* M.Ohki et S.Watanabe (=*B. ovalifolia* Rupr., after Nagamitsu *et al*. 2004). They are restricted to distribute in the special habitat, among the marshy edaphic and have shrub habit (the former grows at the special soil originated from peridotite, the latter mainly distributes in wetlands in the eastern Hokkaido).

Taxonomic traits of larch

Larix Miller is one of 10 genera in the family Pinaceae. Members of the genus are restrictedly distributed to the northern hemisphere (Schorn 1994, Osawa *et al*. DOI 10.1007/978-1-4020-9693-8,). There are 10 genera in Pinaceae family: *Pinus* Linn., *Picea* Dietr., *Cathaya* Chun and Kuang, *Pseudotsuga* Carr., *Larix* Mill., *Pseudolarix* Gord., *Cedrus* Trew., *Tsuga* Carr., *Keteleeria* Carr. and *Abies* Mill. (Li 1995, Price *et al*. 1987). However, there are 11 genera, plus *L. nothotsuga*, according to Liston (2003). Over 200 species, nearly 235 species (Li 1995) contains in this Pinaceae, known as the largest family of the cone plants. However, Liston *et al*. (2003) supports there are 225 species in this family, stands up as the largest family of non-flowering seed plants. They distribute mainly in the north hemisphere, north temperate belt and subtropical mountains and play an important role in the conifer forest. Pinaceae is a very large group of plants in geological stages, most of the genera extinct during Mesozoic. Modern Pinaceae maybe offspring of a few temperate adapted members, gradually, they developed into the main components of current conifer forests (Eckert and Hall 2006, Li 1995, Price *et al*. 1987).

Larch is one of the most developed genera according to the reference works as follows: There are 2 sections in *Larix*: Sect. *Multiseriales* and Sect. *Larix*, those include 15 species and 3 varieties (Abaimov *et al*. 2000, Li 1995, Martinsson and Takata, 2005). The characters of larches are typical light-demanding and deciduous conifer with some unique foliar habits, i.e. dimorphism shoots and deciduous needles (Gower and Richards 1990). Usually larches can grow 15–50 m tall, the needles turn yellow and fall in the late autumn, leaving the trees leafless through the whole winter. Larch species have two different types of shoots, the short-shoot and the long-shoot (Kitaoka *et al*. 1999, 2000, Qu *et al*. 2005). They extend in different period; this shoot type can benefit the larch species to get the flexibility to unexpected environmental changes. Their cones are erect, small, and ripening brown and photosynthesize until mature (Wang *et al*. 2006). Half of the species have long and visible bract. On the other hand, species native to northern regions have small cones with short bracts while species native to southern regions have longer cones and longer bracts.

Geographic distribution of larch

In China

There are 10 species plus one variety distribute in China (Liu *et al*. 2002, Zheng 1983). They are *L. griffithiana*, *L. speciosa*. *L. chinensis*, *L. gmelinii*, *L. himalaica*, *L. mastersiana*, *L. olgensis*, *L. potaninii*, *L. potaninii* var. *macrocarpa*, *L. principis-rupprechtii* and *L. sibirica*.

The southern limit distribution of larch species is located in China. Larch can be found even around 26.4^{o} N, up to about 4000 m elevation. Similar to birch in China, larches also mainly occupy the mountains: the Himalaya-Hengduan Mountains (Qingzang altiplano), the Qinling Mountains, the Altai Mountains, the Taihang Mountains, the Daxing'anling-Xiaoxing'anling Mountains and the Changbai Mountains. In addition, the Himalaya-Hengduan Mountains has the highest diversity of larches than the other parts of larch distribution regions. In southwestern China, totally there are 5 species plus one variety. Himalaya-Hengduan Mountains also is considered as the distribution central of larch in China (Liu 2002).

Larix griffithiana: this species can survive in drought, infertile soil, and can naturally regenerate well. It can be found their growth in southern Tibet, northern slope and southeastern slope of Himalaya Mountains and the elevation is around 3000 m to 4000 m. The average temperature of the coldest month is from 0°C to – 8°C and the lowest temperature is from – 20°C to – 30°C (Zheng 1983). *L. speciosa* can live around 2600–4100 m. Bellow 2800 m, they usually mix with *Tsuga dumosa*, and form the mixed forest with *Abies nukiangensis* and *A. georgei*, between 2800 m and 3800 m. *L. mastersiana* can reach 25 meter tall. It mainly distributes in the Sichuan province ranging the altitude between 2300 m and 3500 m. In the past day, there was a large area of pure *L. mastersiana* forest. However, so many trees were harvested, then only small amount forests are remained. *L. himalaica* grows in the south of Tibet and the north sloop of Mount Everest, the altitude is around 2800 m and 3600 m high. They can survive on the strand, beach of ice melting streams and rivers; tolerate the low temperature and poor nutritional condition.

Larix chinensis, mainly distributes in the Qinling Mountains in the Shaanxi province, especially in the Taibai Mountains (Zheng 1983). They can form pure forests at altitude 3000–3500 m. In addition, this species can grow well in the shading or semi-sunny slope. However, the growth speed is relatively slow. In the lower parts of vertical distribution range, *L. chinensis* can reach 13.4 m tall and the diameter at breast height is around 26.4 cm, usually they mix with firs and birches. In the pure forest, trees are quite straight and uniform. In the upper part of the vertical distribution belt, old trees aged around 150–200 years can reach 2–4 m tall, and the diameter in breast height is around 10–18 cm.

Larix potaninii can reach 50 m tall. It has good regeneration ability, especially in the clear cutting forest or fired forest. However, they can not naturally regenerate well under the canopy shading. Without shading, they can occupy the site quickly and develop as transitional pure forest. We can find *L. potaninii* in the southern Gansu province (around 35°N), the Minjiang drainage basin (31°N–33°N, 102°E–104°E), the Jinchuan drainage area, Kangding, Danba and so on,

around 2500–4100 m high areas. Actually, fir, spruce and this larch form a mixed conifer forest around 2500–4000 m elevation, the canopy of *L. potaninii* is usually higher than the other two species. Between 3800–4000 m elevation, *L. potaninii* can form stable pure forest, ascending to 4100 m, the larch will exist less than 3 m tall as thin forest. *L. potaninii* var. *macrocarpa* distributes in the southern Sichuan province, the northwestern Yunnan province and the southeastern Tibet province. The altitude of these regions is around 2700–4200 m. They usually grow along the mountains ridge, form narrow and long-belt pure forest or mix with birch, fir, spruce or pine (Liu 2002, Zheng 1983).

Larix sibirica mainly distributes in the Altai and Tianshan Mountains, known as its great drought tolerance and low temperature tolerance (minimum –40°C). In northwestern direction of Altai Mountains around 1900–3500 m altitude, they show a mixed forest with *Pinus sibirica* and *Abies sibirica*. In southeastern direction of the Altai Mountains around 1000–2600 m altitude, they can form pure large sized forests, i.e. there are some zonal pure forests in southern direction of the Altai Mountains. Also, we can find zonal pure forests or mixed forests with birch in eastern direction of the Tianshan Mountains around 2100–2800 m elevation. *L. principis-ruprechitii* distributes in the northern Hebei province, Beijing district and high elevation mountains of the Shanxi province. They form a small size pure forest or mixed forests with *Picea meyeri*, *Picea wilsonii*, *Populus davidiana*, *Betula dahurica*, *Betula platyphylla* and so on among 1800–3000 m elevation (Zheng 1983).

Larix gmelinii is a popular species in the northeastern China: the Daxing'anling Mountains and the Xiaoxing'anling Mountains. The distributional elevation is among 300–1700 m. They can tolerance cold weather condition: one growth season only 100 days or 120 days, the cold winter (temperature bellow zero) usually continue 7 or 8 months. The lowest temperature can reach at around – 50°C. In the Daxing'anling Mountains, we have permafrost soil at one meter under ground (Shi *et al*. 2010).

Larix olgensis occupies the Changbai Mountains with the elevation among 500–1800 m. They adapt to cold and wet climate, and can grow among the stream strand and marsh while they can also tolerate the drought condition.

According to the national forest resource survey in 1988, there was about 119.23 $\times 10^4$ ha of larch plantations in northern China, occupying around 25% forest areas (Leng *et al*. 2008, Liu *et al*. 1998). There are 6 species growing in southwestern China (Sichuan, Yunnan and Tibet), three species growing in the northwestern China: one species popular in the central China and two kinds of main larches are dominant in the northeastern China (Table 2).

Nowadays, China has introduced several new species for plantation: *L. deciduas*, *L. kaempferi* and hybrid larch F_1 (*Larix gmelinii* var. *japonica* × *L. kaempferi*) (Shi *et al*. 2001). They can well adapt to the climate, and have good productivity and make a great contribution to the reforestation. However, mono-culture plantation with only one larch species also show some disadvantage, such as soil degradation, loss of biodiversity, high sensitivity to disease and insect disaster, and especially found in U.K. (Brasier and Webber 2010).

In Japan

There are 2 native species in Japan: *Larix kaempferi* (Lamb.) Carr. and *L. gmelinii* (Rupr.) Rupr. The latter species (*L. gmelinii*) is currently found in Hokkaido as

Table 2. Larch distribution in China

Section	Species	Latitude (°N)	Longitude (°E)	Elevation (m)	District
Sect. Multiseriales	*L. griffithiana*	87–95.5	27.8–30.8	2800–4300	Himalayas M.
	L. speciosa	95.3–99.9	25.9–30.2	2600–4100	Northwestern Yunnan Province, Southeastern Tibet province.
	L. mastersiana	102.3–104.1	30.3–32.5	2300–3500	Sichuan Province
	L. himalaica	85.2–87.1	28.3–29	2800–3600	Everest M.
	L. chinensis	107–108.8	33.8–34.1	2600–3500	Qinling M.
	L. potaninii	99–105.5	28.6–34.6	2500–4100	Southern Gansu Province, Minjiang river drainage area, Dajinchuan, Xiaojinchuan river drainage area.
	L. potaninii var *macrocarpa*	97.5–102.5	26.4–30.5	2700–4200	Southwestern Sichuan Province, Northwestern Yunnan Province, Southeastern Tibet province.
Sect. Larix	*L. sibirica*	85.7–95	42.8–48.2	1000–3500	Altai M., Eastern Tianshan M.
	L. principis-rupprechtii	111–118	36.5–43.5	1400–3300	Northern Hebei Province, Beijing, Shanxi Province.
	L. gmelinii	121–125	47.6–53.5	300–1700	Daxing'anling M., Xiaoxing'anling M.
	L. olgensis	127–130	40.5–44.8	500–1800	Changbai M., Zhangguangcai M., Laoye M.

fossil. The name of Japanese larch (*L. kaempferi*) is the same species of *L. leptolepis* Gordon (Koike *et al*. 2000). They grow naturally in Honshu mountains areas, Japan. Since Japanese larch has good tolerance to cold moist climate and grows rapidly (Matyssek and Schulze 1987 a, b, 1988), they are once planted throughout northern Japan for reforestation or rehabilitation of bare ground. Due to their high production rate as for timber production, they had been reforested intensively in northern Japan. It is said that the plantation area of Japanese larch in Hokkaido was around 462,000 ha, which comprised about 31% of all the trees planted in 1996 (Ohga 1998). Also, China introduced Japanese larch for reforestation in the northeastern China, i.e. the Hebei province, the Shandong province and the southwestern China.

There is one variety in Japan, *L. kaempferi* var. *rubescens*. This species grows more rapidly and has better tolerance to cold than other traditional silvicultural species in Japan. Consequently, the larch covered the Hokkaido Island widely as if it were the shape of Hokkaido Island (Ryu *et al*. 2009). However, introduced Japanese larch from central Japan has been suffering from severe damages caused by the shoot blight disease and the grazing by Red-back voles in man-made forests.

Fortunately, hybrid larch F_1 (*Larix gmelinii* var. *japonica* × *L. kaempferi*) was developed by the crossing by female Dahurian larch (*L. gmelinii* var. *japonica* Pilg.) with a pollen parent of Japanese larch (*L. kaempferi* Carr.). The hybrid larch F_1 has more suitable characteristics to the boreal region (Koike *et al*. 2000, Kuromaru 2008). It has much better tolerance to the shoot blight disease, the grazing by the Red back vole and deer, and the damaging by wind and snow. More amazing characters and utilities of hybrid larch F_1 are under research (Ryu *et al*. 2009).

Dahurian larch (*L. gmelinii* var. *japonica*) is another promising species for afforestation. They grow very fast, high yield and have good tolerance to the infertile. Dahurian larch is also evaluated by the good capacity of carbon sink. They original distributed at the Kurile islands, but now they were introduced to most of the temperate forests, such as Siberia, Northeastern China, Hokkaido Island and so on (Kelliher *et al*. 1997, Wang *et al*. 2008).

Concluding remarks

In this paper, we reviewed the previous studies of birch and larch distribution and the **taxonomic traits** in China and Japan. It is clear that birches as a pioneer species can survive in a wide range along edaphic conditions and climate, increasing the carbon sink with high CO_2 fixation capacity and high specific gravity, thus do a great contribution to moderate the environment, improving economics and enlargening re-vegetation areas. Though birches evolved relative new species or migrate to other districts owing to the environment changes, some species restrictedly distributed to the special site or niche, and can not grow in other geographic places, such as narrow distribution of *Betula maximowicziana.* It is well known that useful chemical products and tree sap production can be extracted from birch species: the commerce utility may enlarge the plantation area. This may also affect birch distribution trend, not only for re-vegetation but also as a consumable product in our daily life.

Secondly, larch as another one of the promising re-vegetation species contributed greatly to the changing environment too. Larches have great distribution area in the north hemisphere forest, especially the taiga and permafrost region. As an increase of the forest area, larch forests prevent the soil erosion, hold the slope landslide, etc. Especially the hybrid larch F_1 increased some amazing strong physiological traits and can stand up in severe circumstance (Koike *et al*. 2000, Kuromaru 2008). In order to avoid the disadvantage of pure forest plantation, we should introduce more scientific management stratagems.

Although both of birch and larch have similar growth traits, such as light demanding and preference to fertile soil habitat, they can survive in the severe environment region, higher mountain sites or along the upper part of valley. Both species play an important role in preventing soil erosion, slop slide and in increasing carbon sink. Climate change and plants evolution have subtle interaction relationship. In order to survive, plants have to evolve themselves to adapt to the environment stresses. On the other hand, forests can improve the surrounding environments (Darbah *et al*. 2009). As a result, different regions developed unique congruence species. Therefore, the distribution characteristics of plants are not only one attractive point to biologists but also can conduct to afforestation and re-vegetation practices. In a word, both birch and larch can be used widely as promising materials of re-vegetation in the north temperate hemisphere.

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