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PATENTS ACT, 1978

# CERTIFICATE

In accordance with section 44 (1) of the Patents Act, No. 57 of 1978, it is hereby certified that:

**YANBIAN UNIVERSITY**

Has been granted a patent in respect of an invention described and claimed in complete specification deposited at the Patent Office under the number

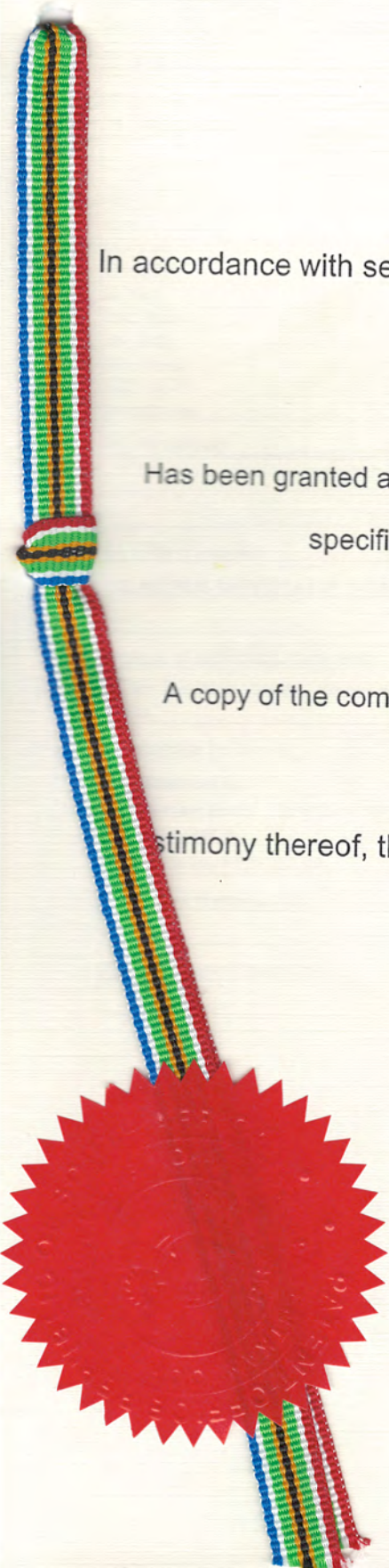
**2022/05205**

A copy of the complete specification is annexed, together with the relevant Form P2.

In testimony thereof, the seal of the Patent Office has been affixed at Pretoria with effect from the 29<sup>th</sup> day of June 2022

A handwritten signature in black ink, appearing to be 'D.H.', written over a horizontal dotted line.

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TITLE OF INVENTION

54	<b>CELASTRUS ORBICULATUS THUNB SEEDLING CULTIVATION METHOD</b>
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## **CELASTRUS ORBICULATUS THUNB SEEDLING CULTIVATION METHOD**

### **TECHNICAL FIELD**

[01] The present invention belongs to the technical field of crop breeding, and particularly relates to a *Celastrus orbiculatus* thunb seedling cultivation method.

### **BACKGROUND ART**

[02] *Celastrus orbiculatus* thunb is a deciduous vine of *Celastrus orbiculatus* thunb genus in Celastraceae family. The bark is light taupe, and long branches are spreading and slightly entwined. Simple leaves are alternate, and the leaves are nearly round and obovate. It is dioecious with capsules. The flowering period is from May to June, and the fruiting period is from September to October. It is photophil, shade-tolerant, thermophilic and cold-resistant. Without strict requirements for soil, *Celastrus orbiculatus* thunb is distributed in stony hillsides, valleys, miscellaneous forests and bushes. In autumn, the leaves turn red, and the capsules crack to reveal bright red arils. It is an important vine ornamental tree. The whole plant can be used as medicine, having the effects of activating *qi*, promoting blood circulation, expelling wind and removing cold. Owing to an oil content as high as 50%, industrial oil can be extracted from the seeds. Therefore, *Celastrus orbiculatus* thunb is a treasure with a high economic value. The breeding methods include sowing, cuttage, layering and division propagation. Although the cuttage, the layering and the division propagation can maintain hereditary traits, they destroy the germplasm resources of plants and have a low reproduction coefficient. Therefore, breeding by sowing not only protects the germplasm resources of wild plants and improves the reproduction coefficient, but also maintains genetic diversity, thereby having a potential value for the selection of landscaping varieties.

### **SUMMARY**

[03] In view of this, the present invention is intended to provide a *Celastrus orbiculatus* thunb seedling cultivation method, by which seedling cultivation is performed in containers, and biennial *Celastrus orbiculatus* thunb seedlings are successfully cultivated and grow strongly with high ground diameters and good trunk shapes.

[04] In order to realize the above-mentioned objective, the present invention adopts the following technical solutions:

[05] The present invention provides a *Celastrus orbiculatus* thunb seedling cultivation method, including the following steps: (1) after breaking the dormancy of *Celastrus orbiculatus* thunb seeds, performing disinfection and pregermination to obtain seeds to be sown;

[06] (2) broadcasting the seeds to be sown on a seedbed of a greenhouse, and watering after soil is covered;

[07] (3) after 2 true leaves emerge from seedlings, transplanting the seedlings into nutrient cups for cultivation, and transplanting the seedlings together with soil to a young forest of *Pinus tabulaeformis* to continue cultivation when a root system of the

*Celastrus orbiculatus* thunb in each nutrient cup has grown to spread all over the nutrient cup;

[08] (4) lifting the seedlings in late October, and burying the seedlings in a fake planting ditch for overwintering; and

[09] (5) after the soil thaws in the coming year, digging out the overwintering seedlings, and then transplanting the overwintering seedlings in a field after stumping.

[10] Preferably, in step (1), the collected or preserved *Celastrus orbiculatus* thunb seeds are immersed in water at 8-12°C to break the dormancy, the immersion lasts for 3 d, and the water is replaced once a day during the immersion.

[11] Preferably, in step (1), the seeds with the dormancy being broken are immersed in a CuSO<sub>4</sub> solution with a mass-to-volume ratio of 1% for disinfection for 3 h, and then rinsed with clean water and pregerminated.

[12] Preferably, the pregermination in step (1) includes mixing the seeds with wet sand at a volume ratio of 1:3, and then placing the mixture in an environment of 2-4°C for 50-60 d.

[13] Preferably, in step (2), a substrate is spread on the seedbed, and the substrate based on parts by volume includes 3 parts of humus and 1 part of sandy soil.

[14] Preferably, after the seeds are broadcast on the seedbed, the seeds are covered with soil, and a seed broadcasting amount is 18-25 g/m<sup>2</sup>; and a soil covering thickness is 1.5-2.0 cm.

[15] Preferably, in step (3), the nutrient cups are filled with the substrate, and one seedling is cultured in each nutrient cup; and the substrate, based on parts by volume, includes 3 parts of humus and 1 part of sandy soil.

[16] Preferably, in step (3), the young forest of *Pinus tabulaeformis* has a height of 130-150 cm, the *Pinus tabulaeformis* trees are at a plant spacing × row spacing of 2 m × 1 m, and the transplanted seedlings are at a plant spacing × row spacing of 60 cm × 20 cm.

[17] Preferably, in step (4), the fake planting ditch is located in the leeward, with a ditch depth of 18-22 cm; the seedlings are placed along the ditch by covering one layer of soil on one layer of seedlings in turn, and a ditch top is covered with straw and finally covered with soil.

[18] Preferably, in step (5), the overwintering seedlings subjected to stumping are transplanted by a mode of large-ridge seedling cultivation; the large-ridge seedling cultivation adopts a ridge width of 60 cm and a plant spacing of 30 cm.

[19] The present invention provides a *Celastrus orbiculatus* thunb seedling cultivation method, including container sowing technique, transplanting and overwintering technique, and stumping and trunk-maintaining technique, providing evidence for seedling production. According to the seedling cultivation method, seeds are taken as materials, seedling cultivation is performed in containers, and biennial *Celastrus orbiculatus* thunb is successfully cultivated. The growth states of the transplanted biennial seedlings subjected to stumping are investigated, and according to the contrast comparison with those not subjected to stumping treatment, there is no significant difference in the seedling height; and the seedlings subjected to stumping grow strongly with high ground diameters and good trunk shapes. In the present

invention, a ground diameter of the seedlings subjected to stumping is 0.517 cm, which is 4.2% greater than that of the seedlings not subjected to stumping treatment; and a height-diameter ratio (the height-diameter ratio refers to a ratio of a seedling height to a ground diameter, reflecting a balanced relation between the height and the thickness of a seedling, and it is a better indicator for reflecting the resistance of seedlings and a survival rate of afforestation) of the seedlings subjected to stumping is 61.5, which is less than 63.3 as the height-diameter ratio of the seedlings not subjected to stumping treatment. It is generally believed that seedlings with big original ground diameter and small height-diameter ratio during afforestation have significantly better survival rate of afforestation and better growth than other seedlings.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

- [20] FIG. 1 is a growth curve of annual seedlings transplanted to a field.
- [21] FIG. 2 is a growth curve of biennial seedlings not subjected to stumping.
- [22] FIG. 3 is a growth curve of biennial seedlings subjected to stumping.
- [23] FIG. 4 is a growth curve of subterraneous stems of biennial seedlings not subjected to stumping.

#### **DETAILED DESCRIPTION OF THE EMBODIMENTS**

- [24] The present invention provides a *Celastrus orbiculatus* thunb seedling cultivation method, including the following steps: (1) after breaking the dormancy of *Celastrus orbiculatus* thunb seeds, performing disinfection and germination to obtain seeds to be sown;
- [25] (2) broadcasting the seeds to be sown on a seedbed of a greenhouse, and watering after soil is covered;
- [26] (3) after 2 true leaves emerge from seedlings, transplanting the seedlings into nutrient cups for cultivation, and transplanting the seedlings together with soil to a young forest of *Pinus tabulaeformis* to continue cultivation when a root system of the *Celastrus orbiculatus* thunb in each nutrient cup has grown to spread all over the nutrient cup;
- [27] (4) lifting the seedlings in late October, and burying the seedlings in a fake planting ditch for overwintering; and
- [28] (5) after the soil thaws in the coming year, digging out the overwintering seedlings, and then transplanting the overwintering seedlings in a field after stumping.
- [29] In the present invention, after the dormancy of *Celastrus orbiculatus* thunb seeds is broken, disinfection and germination are performed to obtain seeds to be sown. In the present invention, there is no special limitation to the source of *Celastrus orbiculatus* thunb seeds, and it is preferable to obtain seeds to be purified by drying harvested fruits and removing impurities after knocking, with a seed rate of up to 44%. In the present invention, the obtained seeds of the current year need to be dried first and then sealed and stored in a refrigerator (at a temperature of 2-4°C), and a thousand seed weight of the seeds is 11.0 g. The *Celastrus orbiculatus* thunb seeds belong to a shallow dormancy type, and it is preferable to break the dormancy and perform disinfection and pregermination at 2 months before sowing, wherein the collected or preserved *Celastrus*

*orbiculatus* thunb seeds are preferably immersed in water at 8-12°C to break the dormancy, the immersion preferably lasts for 3 d, and the water is preferably replaced once a day during the immersion. In the present invention, the seeds with the dormancy being broken are preferably immersed in a CuSO<sub>4</sub> solution with a mass-to-volume ratio of 1% for disinfection for 3 h, and then rinsed with clean water and pregerminated. In the present invention, the pregermination preferably includes mixing the seeds with wet sand at a volume ratio of 1:3, and then placing the mixture in an environment of 2-4°C for 50-60 d.

[30] In the present invention, the obtained seeds to be sown are broadcast on a seedbed of a greenhouse, and watering is performed after soil is covered. In the present invention, a substrate is preferably spread on the seedbed, and the substrate, based on parts by volume, preferably includes 3 parts of humus and 1 part of sandy soil. In the present invention, there is no special limitation to the preparation method of the substrate, and the method preferably includes the following steps: mixing the humus and the sandy soil evenly, then removing impurities by sieving, and disinfecting the evenly mixed mixture using 50% Carbendazim wettable powder. In the present invention, there is no special limitation to the disinfection method, and the method preferably includes the following steps in an embodiment: after properly drying the substrate, spraying 500 × solution Carbendazim and mixing the substrate and the Carbendazim; and 20-25 g of 50% Carbendazim wettable powder is used for every 1 m<sup>3</sup> of substrate. In the present invention, the seedbed is preferably 3.3 m long, 1.0 m wide and 0.10 m high. In the present invention, the seeds are evenly spread on the seedbed, and a seed amount is preferably 18-25 g/m<sup>2</sup>, and more preferably 20 g/m<sup>2</sup>. In the present invention, the seeds are covered with soil after broadcasting and a soil covering thickness is preferably 1.5-2.0 cm.

[31] After the sowing, the present invention preferably further includes the management of the sowing land, and more preferably includes: watering with a fine-eye watering can in a principle of small amount and high frequency, in order to prevent excessive waterlogging or excessive drought to affect the growth of seedlings; and performing weeding as early as possible when weeds begin to sprout. In the present invention, the seedlings basically emerge at about 10 d after the broadcasting, and in order to prevent and control damping off, it is preferable to spray the roots using 600× solution Carbendazim every other week.

[32] In the present invention, after 2 true leaves emerge from the seedlings, the seedlings are transplanted into nutrient cups for cultivation, and when a root system of the *Celastrus orbiculatus* thunb in each nutrient cup has grown to spread all over the nutrient cup, the seedlings together with soil are transplanted to a young forest of *Pinus tabulaeformis* for continuous cultivation. In the present invention, the nutrient cups are preferably filled with a substrate, and one seedling is cultured in each nutrient cup; and the substrate, based on parts by volume, preferably includes 3 parts of humus and 1 part of sandy soil. In the present invention, the preparation method of the substrate is the same as that described above, which will not be repeated again. In the present invention, the nutrient cups are preferably soft black plastic cups with an opening diameter of 9 cm. In the embodiment of the present invention, the nutrition cups are purchased from a

production material store in Longjing City. In the present invention, during the transplanting, it is preferable to pay attention to keeping the seedling roots fully stretched, and preventing the roots from buckling; and after the transplanting, it is preferable to water the seedling sufficiently. In order to reduce leaf transpiration and improve a survival rate of the seedlings, the seedlings can be placed in full light after shading for 5 d. During this period, the moisture of the transplanted seedlings should be ensured, and the weeds should be pulled out in time.

[33] When a root system of the *Celastrus orbiculatus* thunb in each nutrient cup has grown to spread all over the nutrient cup, the seedlings together with soil are transplanted to a young forest of *Pinus tabulaeformis* with a height of 130-150 cm for continuous cultivation. In the young forest of *Pinus tabulaeformis* of the present invention, the *Pinus tabulaeformis* trees are preferably at a plant spacing  $\times$  row spacing of 2 m  $\times$  1 m, and the transplanted seedlings are preferably at a plant spacing  $\times$  row spacing of 60 cm  $\times$  20 cm. In the present invention, during the continuous cultivation, the management focuses on weeding, watering by single plant irrigation, and keeping the soil wet in a taproot distribution layer.

[34] In the present invention, the seedlings are lifted in late October, and then buried in a fake planting ditch for overwintering. In the present invention, it is preferable to lift the seedlings, dig the pitch and perform fake planting for overwintering in late October. In the present invention, the fake planting ditch is preferably located in the leeward, and a ditch depth is preferably 18-22 cm, and more preferably 20 cm. In the present invention, the seedlings are preferably placed along the ditch layer by layer in a sequence of one layer of seedlings and one layer of soil, and a ditch top is covered with straw and finally covered with soil; a thickness of each layer of soil is limited by fully covering without exposing the seedling roots, a thickness of the straw is 20-30 cm, and 10-15 cm thick soil is the best.

[35] In the present invention, after the soil thaws in the coming year, the overwintering seedlings are excavated, and then transplanted in a field after stumping. In the present invention, it is preferable to dig out the overwintering seedlings (not to damage the seedlings) when the soil thaws in the coming year, and then transplant the overwintering seedlings in a field after stumping. In the present invention, the mode of large-ridge seedling cultivation is preferably adopted for the transplantation, a ridge width is preferably 60 cm, and a plant spacing is preferably 30 cm.

[36] The *Celastrus orbiculatus* thunb seedling cultivation method provided by the present invention will be explained in detail below in combination with embodiments, and the embodiments should not be understood as a limitation to the protection scope of the present invention.

[37] **Example 1**

[38] 1. Test materials

[39] 1.1 Source of seeds

[40] In early October, 2017, seeds were collected from a miscellaneous forest on a hillside of Quanhe Customs in Huichun City.

[41] 1.2 Preparation of substrate

[42] The substrate was prepared from 3 parts of humus + 1 part of sand based on



parts by volume. The humus and the sand were evenly mixed and then sieved to remove impurities. The prepared substrate was disinfected using 50% Carbendazim wettable powder. The method included the following steps: after the substrate was properly dried, 500 × solution Carbendazim was sprayed, and the substrate and the Carbendazim were mixed. 20-25 g of 50% Carbendazim wettable powder was used for every 1 m<sup>3</sup> of substrate.

[43] 1.3 Selection of containers

[44] Soft black plastic cups with an opening diameter of 9 cm were selected and purchased from a production material store in Longjing City.

[45] 2. Seedling cultivation environment

[46] 2.1 Environmental condition from sowing to transplanting

[47] Sowing and cultivation were performed in a glass greenhouse, with a temperature controlled within a range of 20±5°C. When the temperature exceeded 25°C, a cooling system was started for cooling.

[48] 2.2 Overview of transplanting field

[49] The transplanting field is a teaching nursery garden of a college. The soil is loam with a pH value of 6.8. The soil layer is deep and fertile, with an underground water level of 1.0-1.5 m. The transplanting field has an annual precipitation of about 500 mm; an annual average temperature of 5.1°C, a maximum air temperature of 37°C, a minimum air temperature of -36.5°C, an effective accumulative temperature (>5 °C) of 2,962.7°C, and a frost-free period of 140 d.

[50] 3. Seedling cultivation technique

[51] 3.1 Cultivation technique of annual seedlings

[52] 3.1.1 Fruit preparation and seed treatment

[53] 3.1.1.1 Fruit preparation

[54] The collected fruits were sun-dried and knocked, and then impurities were removed to obtain pure seeds, with a seed rate of 44%.

[55] The seeds were dried and then sealed and stored in a refrigerator (at a temperature of 2-4°C). A thousand seed weight of the seeds was 11.0 g.

[56] 3.1.1.2 Seed treatment

[57] The *Celastrus orbiculatus* thunb seeds belong to a shallow dormancy type. The seeds were treated on January 17, namely 2 months before sowing. After being immersed in cold water for 3 d (the water was replaced every day), the seeds were disinfected with a 1% CuSO<sub>4</sub> solution for 3 h. The seeds were rinsed with clear water before being mixed with wet sand in an amount 3 times that of the seeds, and then the mixture was placed at 2-4°C for pregermination.

[58] 3.1.2 Sowing technique

[59] Sowing was performed in a greenhouse on March 17. The soil used was an artificially prepared and disinfected substrate. A seedbed was 3.3 m long, 1.0 m wide and 0.10 m high. The sowing method was broadcasting. That is, the seeds were evenly broadcast on the seedbed. About 20 g of seeds were sowed in every 1 m<sup>3</sup>. A soil covering thickness was 1.5-2.0 cm. The seeds were covered by original soil.

[60] 3.1.3 Management of sowing field

[61] Watering was performed with a fine-eye watering can in a principle of small

amount and high frequency, in order to prevent excessive waterlogging or excessive drought to affect the growth of seedlings. Weeding was performed as early as possible when weeds were as low as possible.

[62] The seedlings basically emerged at about 10 days after the sowing. In order to prevent and control damping off, the roots were sprayed using 600× solution Carbendazim every other week.

[63] 3.1.4 Seedling transplanting and management

[64] At the end of April, after 2 true leaves had emerged from the seedlings, the seedlings were transplanted into nutrient cups, with 1 seedling in each nutrient cup. During the transplanting, attention was paid to keeping the seedling roots fully stretched, and the roots were prevented from buckling. After the transplanting, the seedlings were watered sufficiently. In order to reduce leaf transpiration and improve a survival rate of the seedlings, the seedlings were placed in full light after shading for 5 d. In this period, the moisture of the transplanted seedlings was ensured. Weeds were pulled out in time.

[65] 3.1.5 Field transplanting and management

[66] In late May, when a root system of the *Celastrus orbiculatus* thunb had spread all over each of the nutrient cups, the seedlings together with soil were transplanted to a young forest of *Pinus tabulaeformis* with a height of 130-150 cm for continuous cultivation. The *Pinus tabulaeformis* was at a plant spacing × row spacing of 2 m × 1 m, and the transplanted seedlings were at a plant spacing × row spacing of 60 cm × 20 cm.

[67] In this period, the management focused on weeding. Watering was performed by single plant irrigation at a proper time and proper amount.

[68] 3.1.6 Seedling overwintering and cold-resistant measures

[69] At the end of October, the seedlings were lifted, a pitch was dug, and fake planting was performed for overwintering. The fake planting ditch was selected in the leeward, and a ditch depth was 20 cm. The method had the following steps: the seedlings were placed along the ditch layer by layer in a sequence of one layer of seedlings and one layer of soil. A ditch top was covered with straw and finally covered with soil.

[70] 3.2 Cultivation technique of biennial seedlings

[71] In late April of the coming year, the overwintering seedlings were excavated (not to damage the seedlings) when the soil thawed, and then transplanted in a field. Large-ridge seedling cultivation was adopted, with a ridge width of 60 cm and a plant spacing of 30 cm. Stumping was performed every other seedling.

[72] 4. Observation on seedling growth process

[73] 4.1 Growth of annual seedlings transplanted to the field

[74] 10 plants were randomly selected to observe their seedling height and growth process (a ground diameter was not measured). The growth curve is as shown in FIG. 1. The growth of the annual seedlings had a total of 3 peaks, and one high growth retardation occurred at about July 10. The reason was the high air temperature which was not suitable for the seedling growth.

[75] 4.2 Growth of biennial seedlings

[76] 30 plants were randomly selected, wherein 15 seedlings were subjected to stumping. Their seedling height and ground diameter were measured.

[77] The growth curve of the seedlings not subjected to stumping is as shown in FIG. 2. The rapid growth period of the seedlings not subjected to stumping was concentrated in late June to early July. In early August, another small growth peak occurred again. In late August, the seedlings nearly stopped growing and entered a hardening period.

[78] The growth curve of the seedlings subjected to stumping is as shown in FIG. 3. The seedlings subjected to stumping had 3 growth peaks. Wherein early and middle July were high growth peak periods. In middle September, the seedling nearly stopped growing. The seedlings were fully lignified and entered the hardening period.

[79] The growth curve of ground diameter of the biennial seedlings is as shown in FIG. 4. The ground diameter of the biennial seedlings subjected to stumping grew from May 16 to May 30, and a small growth peak occurred firstly. The reason was that apical buds which began to germinate in spring produced hormones transported downwards to stimulate a cambium to grow. A second growth peak was because the high air temperature was not suitable for the seedling growth. However, a soil temperature lower than the air temperature is suitable for the growth of the root system, and the soil also had a sufficient moisture.

[80] 5. Quality of seedlings

[81] 5.1 Quality of annual seedlings

[82] Seedling height: 22.1 cm; ground diameter: 0.291 cm. Wherein a maximum seedling height was 29.2cm; and a maximum ground diameter was 0.324 cm.

[83] 5.2 Quality of biennial seedlings, as shown in Table 1.

[84] Table 1 Quality of Biennial Seedlings

Seedling	Plant Height	Ground Diameter	Fresh Weight (g)			Dry Weight (g)		
			Full Weight	Root Weight	Stem Weight	Full Weight	Root Weight	Stem Weight
Seedlings Subjected to Stumping	31.8	0.517	10.27	7.44	2.83	5.15	3.50	1.65
Seedlings Not Subjected to Stumping	31.4	0.496	—	—	—	—	—	—

[85] According to the contrast comparison between the biennial transplanted seedlings subjected to stumping and those not subjected to stumping, there is no significant difference in the seedling height; and the seedlings subjected to stumping grow strongly with high ground diameters and good trunk shapes. Therefore, stumping should be performed for maintaining the trunk during transplanting.

[86] The contents described above are only a preferred embodiment of the present invention. It should be noted that for those of ordinary skill in the art, some improvements and modifications may be made without departing from the principle of the present invention, and these improvements and modifications should also fall within

the protection scope of the present invention.

## CLAIMS:

The present invention provides a *Celastrus orbiculatus* thunb seedling cultivation method, comprising the following steps: (1) after breaking the dormancy of *Celastrus orbiculatus* thunb seeds, performing disinfection and pregermination to obtain seeds to be sown;

(2) broadcasting the seeds to be sown on a seedbed of a greenhouse, and watering after soil is covered;

(3) after 2 true leaves emerge from seedlings, transplanting the seedlings into nutrient cups for cultivation, and transplanting the seedlings together with soil to a young forest of *Pinus tabulaeformis* for continuous cultivation when a root system of the *Celastrus orbiculatus* thunb spreads all over each of the nutrient cups;

(4) lifting the seedlings in late October, and burying the seedlings in a fake planting ditch for overwintering; and

(5) after the soil thaws in the coming year, digging out the overwintering seedlings, and then transplanting the overwintering seedlings in a field after stumping.

2. The seedling cultivation method of claim 1, wherein in step (1), the collected or preserved *Celastrus orbiculatus* thunb seeds are immersed in water at 8-12°C to break the dormancy, the immersion lasts for 3 d, and the water is replaced once a day during the immersion.

3. The seedling cultivation method of claim 2, wherein in step (1), the seeds with the dormancy being broken are immersed in a CuSO<sub>4</sub> solution with a mass-to-volume ratio of 1% for disinfection for 3 h, and then rinsed with clean water and pregerminated.

4. The seedling cultivation method of claim 1 or 3, wherein the pregermination in step (1) comprises mixing the seeds with wet sand at a volume ratio of 1:3, and then placing the mixture in an environment of 2-4°C for 50-60 d.

5. The seedling cultivation method of claim 1, wherein in step (2), a substrate is spread on the seedbed, and the substrate, based on parts by volume, comprises 3 parts of humus and 1 part of sandy soil.

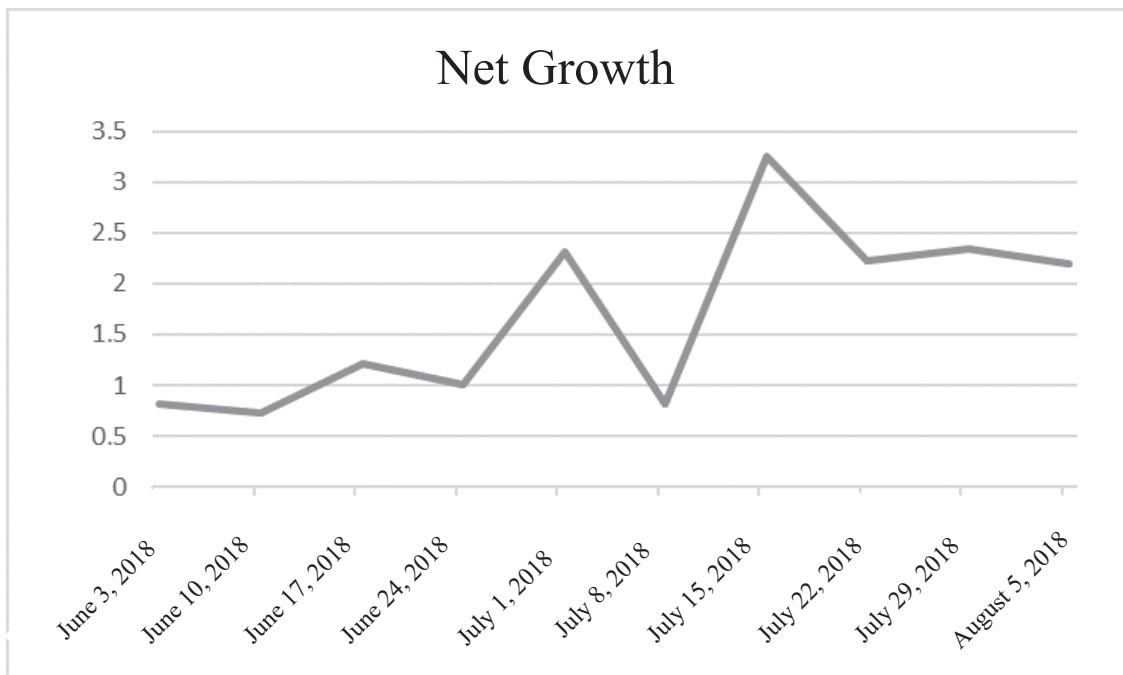
6. The seedling cultivation method of claim 1 or 5, wherein after the seeds are broadcast on the seedbed, the seeds are covered with soil, and a seed broadcasting amount is 18-25 g/m<sup>2</sup>; and a soil covering thickness is 1.5-2.0 cm.

7. The seedling cultivation method of claim 1, wherein in step (3), the nutrient cups are filled with the substrate, and one seedling is cultured in each nutrient cup; and the substrate, based on parts by volume, comprises 3 parts of humus and 1 part of sandy soil.

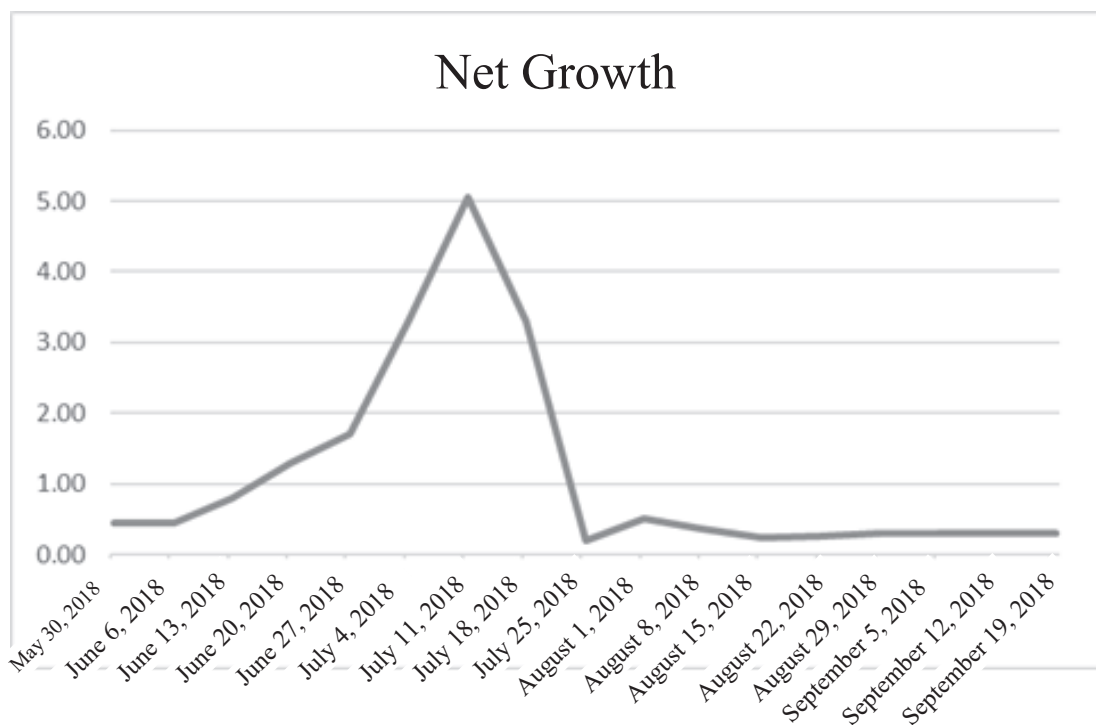
8. The seedling cultivation method of claim 1, wherein in step (3), the young forest of *Pinus tabulaeformis* has a height of 130-150 cm, the *Pinus tabulaeformis* trees are at a plant spacing × row spacing of 2 m × 1 m, and the transplanted seedlings are at a plant spacing × row spacing of 60 cm × 20 cm.

9. The seedling cultivation method of claim 1, wherein in step (4), the fake planting ditch is located in the leeward, with a ditch depth of 18-22 cm; the seedlings are placed along the ditch by covering one layer of soil on one layer of seedlings in turn, and a ditch top is covered with straw and finally covered with soil.

10. The seedling cultivation method of claim 1, wherein in step (5), the overwintering seedlings subjected to stumping are transplanted by a mode of large-ridge seedling cultivation; and the large-ridge seedling cultivation adopts a ridge width of 60 cm and a plant spacing of 30 cm.



**FIG.1**



**FIG.2**

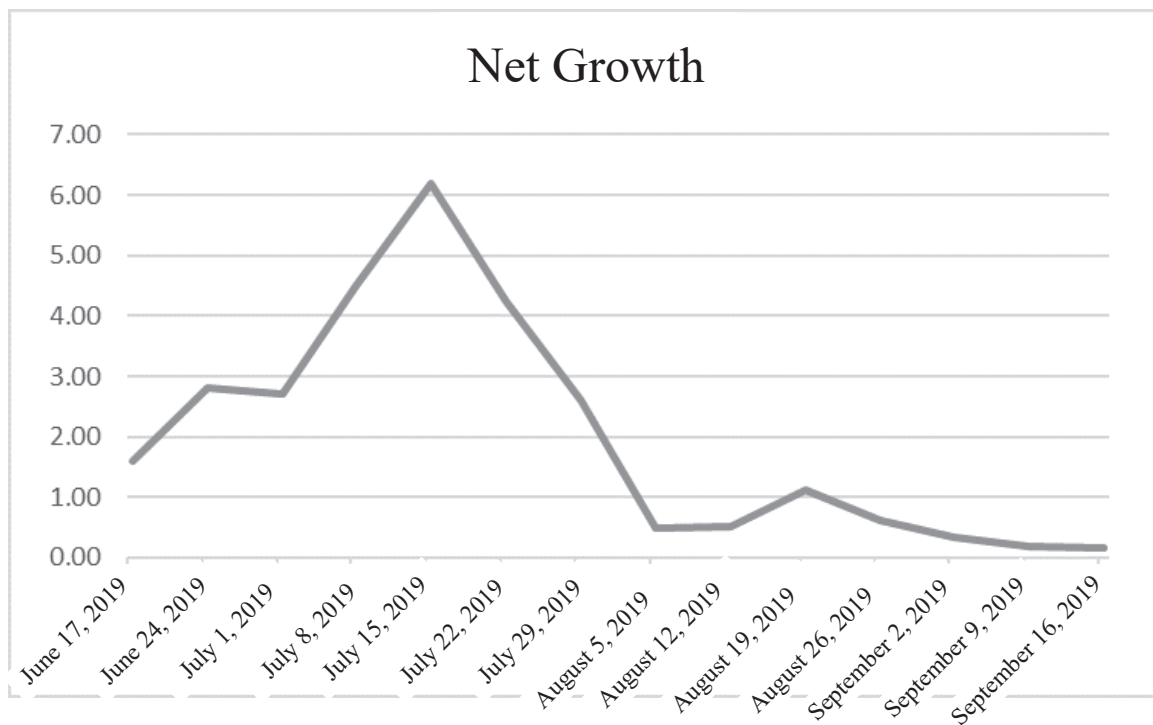


FIG.3

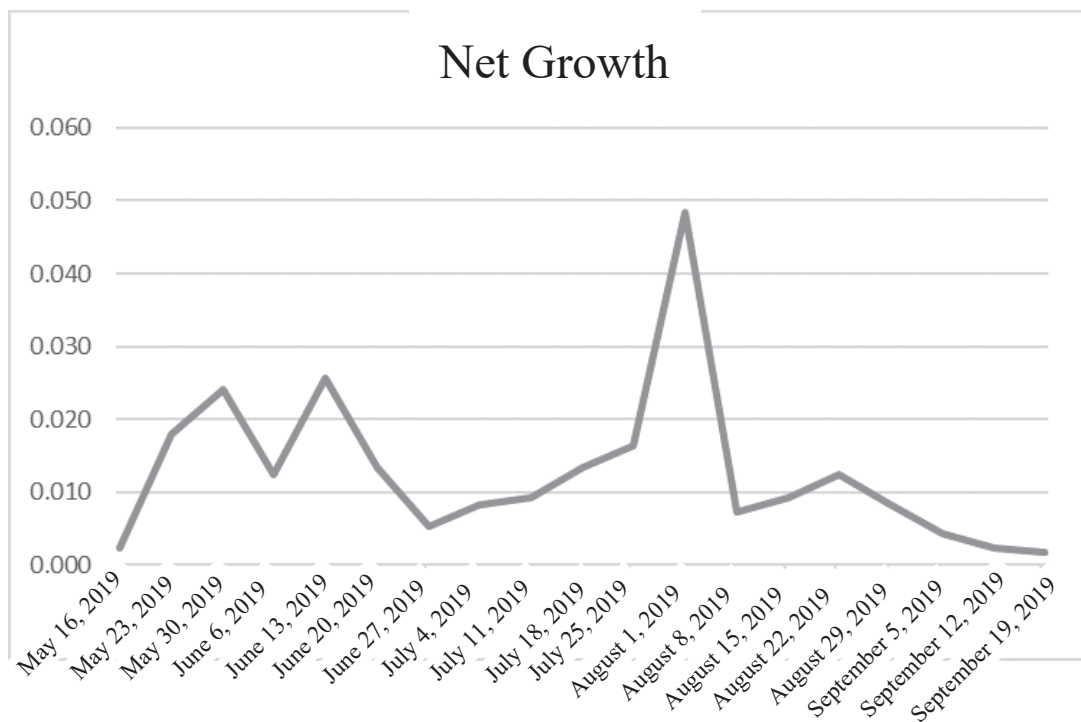


FIG.4