論　文

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Attempts of cuttings utilizing *Criptomeria japonica, Chamaecyparis obtusa,* and *Larix kaempferi* wood for nursery bed.

スギ、ヒノキ、カラマツのチップを用いた挿し木苗養成のこころみ

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要旨：育苗の手法、材料には、様々なものが報告されている。本報では、林地残材の有効活用の一環として、林内に放置されたスギ、ヒノキ、カラマツの間伐材より繊維状の木質チップを作製し、それを挿し床として利用して、その活着率を調べた。挿し木の試供木にはポプラ（*Populus nigra*）を使用し、長さ 20ｃｍの挿し穂を作った。上記のスギ、ヒノキ、カラマツの木質チップをそれぞれプランター（縦 60×横 22×深さ 16㎝）に入れ、１つのプランターに 10 本ずつ、計 40 本（計４プランター）を挿しつけた。なお、対照区として、鹿沼土を挿し床にしたプランターも同数もうけ、それぞれの生長の比較を行った。木質チップの挿し床の含水率はいずれも高く、また苗木の安定性も低かったため、いずれの挿し床においても活着率は著しく低く、スギチップで活着率０％、ヒノキチップ 10%、カラマツチップで 30%という結果となった。

キーワード：挿し木、木質チップ、林地残材、活着率

Abstract: There have been many attempts for cutting methods. This study aimed to research the percentage of cuttings that succeeded utilizing the remaining logs in the forest. We made *Criptomeria japonica*, *Chamaecyparis obtusa*, *Larix kaempferi* wood chip from the remaining logs and used them as a nursery bed for the cuttings. The cuttings of *Populus nigra* cuttings were 20cm long and were planted in a planter (60cm long × 22cm wide × 16cm depth). 10 cuttings were planted in each planter with total of 40 cuttings planted in each of the wood chip varieties. The control nursery bed for this experiment was soil for gardening (Kanuma soil). Water content of the nursery bed of the wood chips was higher and the survival rate was much lower than the control: 0% in the *Criptomeria* bed, 10% in the *Chamaecyparis* bed, 30% in the *Larix* bed.

Keywords: cutting, wood chip, remaining log, survival rate

Ⅰ Introduction

There has been many attempts to use different cutting methods. Two skills are required which are: being able to make tree cuttings, and making nursery beds for the cuttings (*1*)(*2*)(*3*). Some kinds of trees are naturally difficult to make cutting from, such as *Pinus* and *Quercus*. However, there are possibilities to make a new nursery bed for cuttings. Nursery beds support the growth of the cutting's roots and have basic potential for stock.

Therefore, this study mainly focuses on new nursery bed material and the condition of the nursery bed. I utilized wood chips made from the remaining logs in the forest. Following this, I researched the percentage of successful cuttings and their growth in the wood chip beds.

Ⅱ Method

1.　Wood chips made from the remaining logs for a nursery bed

I made wood chips from the remaining logs and used them as a nursery bed for the cuttings. *Criptomeria japonica*, *Chamaecyparis obtusa*, and *Larix kaempferi* wood chips were made from the remaining logs in the Okutama Practice Forest of Tokyo University of Agriculture. The logs were chopped in August of 2014 by the students who were training in the silviculture practicum. Three kinds of wood chips were made by a chainsaw on the 14th of April in 2015. *Populus nigra* cuttings were made from one year old branches of 18m height and 41cm DBH tree.　20cm long cuttings were planted in a planter (60cm long × 22cm wide × 16cm depth on the 17th of April. 10 cuttings were planted in each of the planters with total of 40 cuttings were

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planted in each kind of wood. The control nursery bed was soil for gardening (Kanuma soil).

2. Water condition and water control for growing cuttings

I examined the water absorbing and draining by 10g samples of wood chips and Kanuma soil. Each sample was placed in 300g of water for 24 hours and then the absorption and ability to drain water were tested. In addition to this, the water content was surveyed every month.

Each planters were showered with 2 litters of water every day from the initial planting for one month, after this, 2 litters of water were given per a week.

3. Temperature and light condition

The plantings were taken care of in the green house. Average temperature condition is shown in Fig. 1 and the average temperature of nursery beds is shown in Fig.2. There was not big difference between the average temperature of Kanuma soil and the wood chip beds. Average relative illuminance in the green house was 18% (±2).

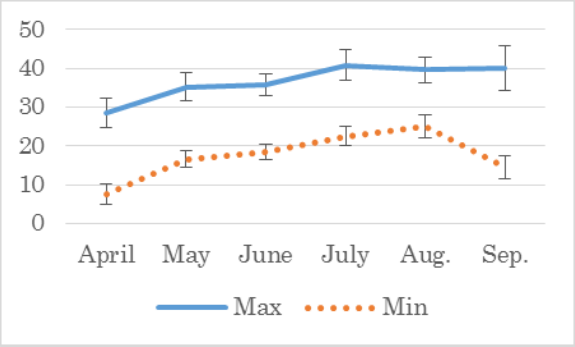

Fig.1. Average temperature condition in the green house (℃)

図－１　温室内の平均気温（℃）

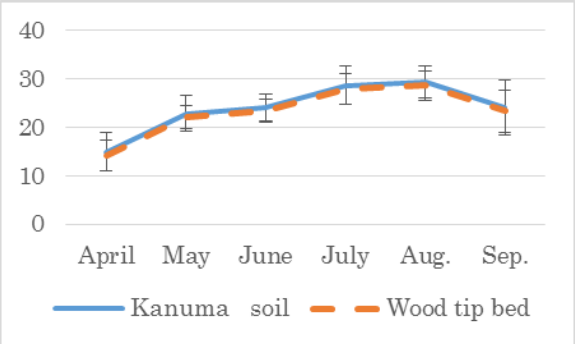

Fig.2. Average temperature of nursery bed（℃）

図－２　挿し床の平均温度（℃）

4. Comparing the water and pH condition of the wood chips and Kanuma soil bed

Water content of each nursery bed was surveyed every month. Draining, absorption, and pH condition of the wood chip and Kanuma soil were surveyed before planting.

Ⅲ Results

1. Successful percentage of cuttings planting and their growth.

①Survival rate Survival rate of the cuttings in each of the nursery beds are shown in Fig.3. The survival rates of wood chip beds were extremely low, compared to the control: 0% in the *Criptomeria* bed, 10% in the *Chamaecyparis* bed, and 30% in the *Larix* bed.

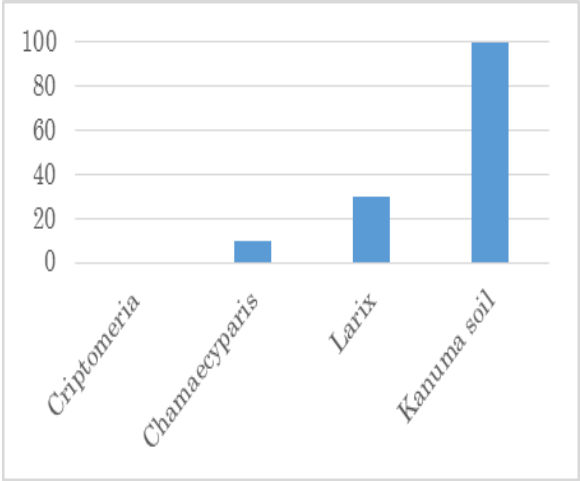

Fig.3. Survival rate of the cuttings in each nursery beds (%)

各挿し床の活着率（%）

②Comparison of root growth Average root weight is shown in Fig.4, average root length is shown on Fig.5, and average root diameter is shown in Fig.6.

Although the survival rate was low, the average amount of roots and the weight of cuttings for the *Larix* wood chip bed were higher than other beds. The result may show the special function of the *Larix* wood content. The average root length of *Larix* was longer as well.

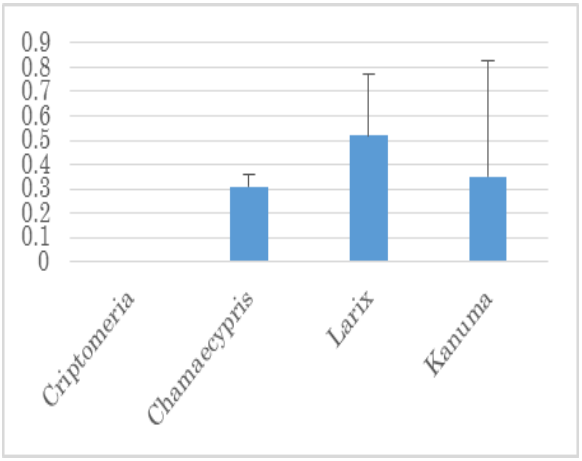

Fig.4. Average root weight of cuttings in each nursery bed (g)

図－４　各挿し床の苗木の平均根重（ｇ）

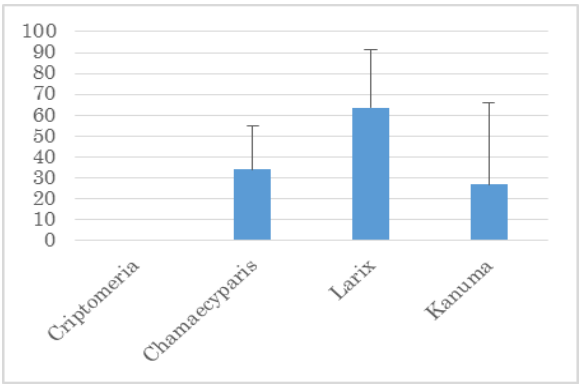

Fig.5. Average root length of cuttings in each beds (cm)

図－５　各挿し床の苗木の平均根長(cm)

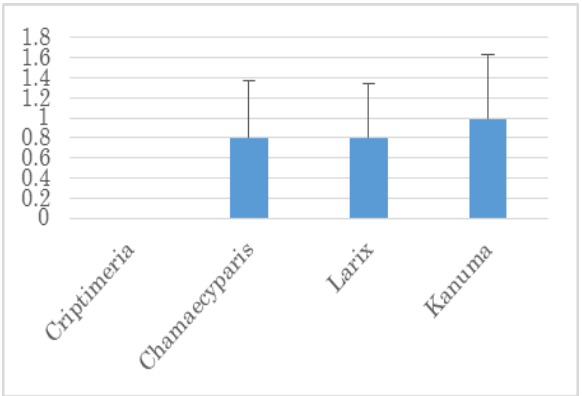

Fig.6. Average root diameter of cuttings in each beds (mm)

図－６　各挿し床の苗木の根の平均直径(mm)

③ **Shoots and adventitious buds**　The average number of adventitious buds is shown in Fig.7, the average number of shoots is shown in Fig.8, and average shoot length is shown in Fig.9.

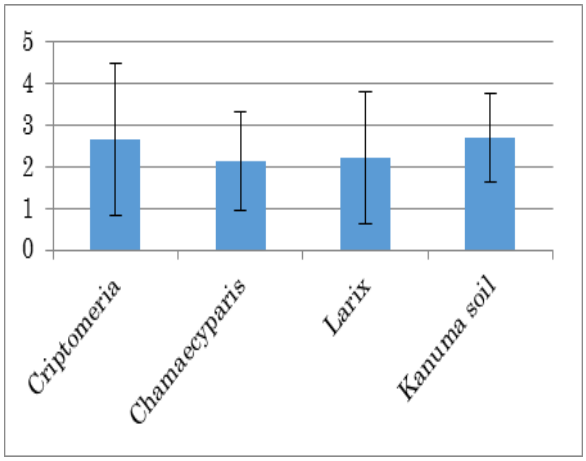

Fig.7. Average number of adventitious buds of cuttings in each nursery bed

図－７　各挿し床の苗木の平均不定芽数

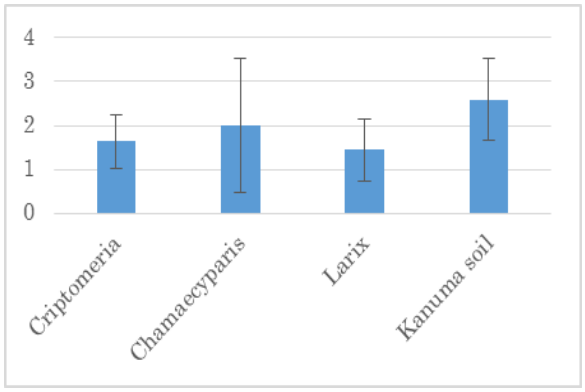

Fig.8. Average number of shoots of cuttings in each beds

図－８．各挿し床の苗木の平均枝数

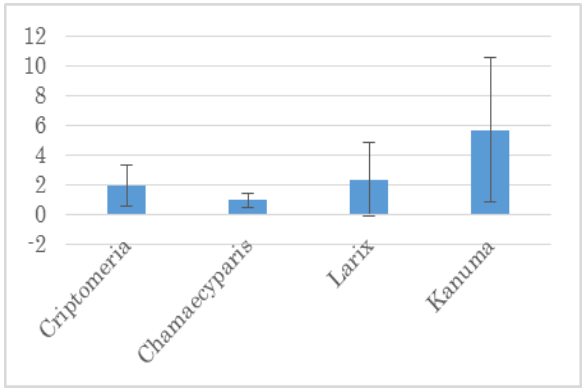

Fig.9. Average shoot length of cutting in each beds (cm)

図－９　各挿し床の苗木の平均枝長(cm)

There were no significant differences in the average number of adventitious buds and shoots, but in average shoot growth of the cuttings in the Kanuma soil showed longest growing time.

④ **Water and pH condition of nursery beds** Absorption within the nursery beds is shown in Fig.10, drainage is shown in Fig.11, and the average water content is shown in Fig.12.

Absorption of wood chip beds were significantly higher than Kanuma soil (Tukey's HSD P <0.01, n=4), drainage of them was also significantly higher than Kanuma soil (Tukey's HSD P<0.001, n=4), and average water content of wood chip beds were higher than Kanuma soil (Tukey's HSD P<0.01, n=4), too.

Also, the pH condition of each nursery beds are shown in Fig.13.

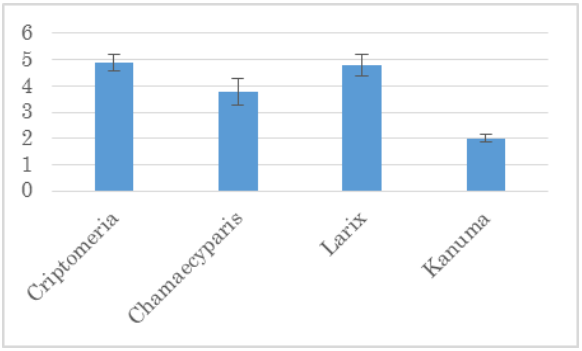

Fig.10Average absorbing of each nursery beds
(Times of dead weight)
図－10　各挿し床の平均吸水率（自重の倍数）

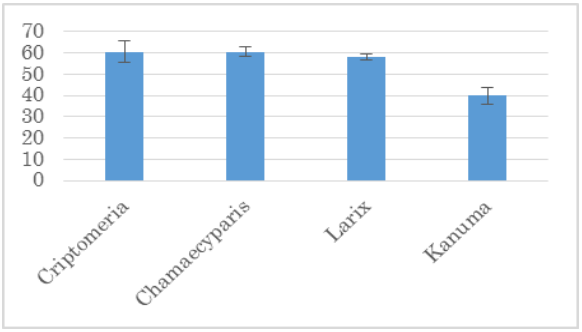

Fig.11 Average drainage of each nursery beds (%)
図－11　各挿し床の平均排水率（%）

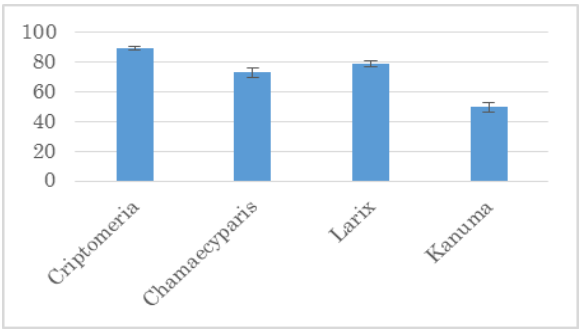

Fig.12 Average water content of each nursery beds (%)
図－12　各挿し床の平均含水率（%）

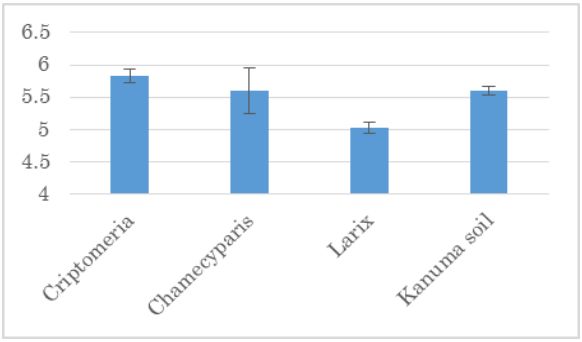

Fig.13 Average pH condition of each nursery beds
図－13　各挿し床の平均ｐＨ値

Ⅳ Discussion

Both absorption and draining in the wood chips were higher than in Kanuma soil. However the average water content of them was also higher, so the cuttings in the wood chips were basically less stable and the cut surface of cuttings was difficult to set in the wood chip. Therefore, the low survival rates of the cuttings in the wood chip beds were attributed to increase water retainage within the woodchips and being unstable. These reasons make it physiologically difficult to absorb water. On the contrary, if the cutting surface set in the wood chip correctly and the cuttings were stable, the survival rate would be improved.

Although the survival rate was low, the average amount of roots and the weight of cuttings for the *Larix* wood chip bed were higher than other beds. The result may show the special function of the *Larix* wood content. The average length and numbers of shoots of *Larix* was longer and bigger as well.

Finally, to improve the survival rate, a new method for making wood chips should be used which is able to control the shape and the size of wood chips. In addition to this, a more precise water control method should also be used. Wood chips may promote growth one time, but may restraint another time. So, another possibility is panting the cuttings in the wood chip nursery bed after the roots are established.

Ⅴ Literature cite

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