

EFFECTS OF LOW TEMPERATURE AND STORAGE PERIODS FOR SEED DORMANCY RELEASE ON *PRUNUS LANNESIANA* WILS. (CARR.) VAR. SPECIOSA

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Abstract

In general, seed germination of *Prunus lannesiana* WILS. (CARR.) var. *speciosa* (Ohsima-zakura) is started in 8 months late after harvesting seeds. For example, store the seeds in soil till next february as soon as harvesting seeds in the middle of june, and sow it in the end of february, so that seed germination will be started in two or three weeks.

So, for early seed germination and early growing up, the requirements of low temperature and storage periods had to be investigated.

The main results were found out, that 3~4°C/12~16 weeks and 8~9°C/12 weeks in wet condition storage were best for accelerating early germination.

However dry condition storage and frozen storage were not good for germination.

Introduction

Prunus lannesiana WILS. (CARR.) var. *speciosa* is very important cherry tree as for rootstock of flowering cherry and fruit cherry, smoke-dried materials of ham and bacon etc., and also the leaves for materials of typical Japanese cake (sakura mochi). This wild cherry trees are native to middle pacific area of Japan.

In Japan, almost flower cherry trees except *Prunus spachiana* KITAMURA (Higan-zakura) are propagated by grafting with *Prunus jamasakura* SIEB. and *Prunus lannesiana* WILS. (CARR.) var. *speciosa*. Generally, it is preferred to *P. lannesiana* WILS., as rootstock for vigorating rootstock.

In 1984, Y. ISHII, Y. KOBAYASHI¹⁾ reported about prechilling time on *P. jamasakura* and *P. lannesiana* var. *speciosa* seeds. In this report, they said that various prechilling time (temp. 3~4°C) for germination is better of over 60 days.

Thereupon, here, for efficient rootstock production, studied on prechilling under some conditions for accelerating early germination.

Material and Methods

Collected *Prunus lannesiana* seeds as soon as dropping at the beginning to middle of june, studied for seed germination after some treatments (removed and unremoved sarcocarp, prechilling at 3~4°C, 8~9°C, -2~-5°C/1~20 weeks in dry and wet conditions).

Experiment 1

Sowed the dropped seeds with sarcocarp and without sarcocarp in plant box under room temperature, and investigated the germination rate at each 4 weeks among half year. Each experiment used 30 seeds as 3 repetitions.

Experiment 2

As low temperature treatments, $-2\sim-5^{\circ}\text{C}$ and $3\sim4^{\circ}\text{C}$, $8\sim9^{\circ}\text{C}$ were done. As prechilling treatment periods, 1 and 2, 4, 8, 12, 16, 20 weeks were done. And, as storage conditions, wet (stored in wet vermiculite) and dry (stored in dry plastic bag) conditions were done.

Together 31 treatments (Table 1) combined with 3 terms were done. Also each experiment was 3 repetitions.

Table 1 — Experimental design for Experiment 2 : composition of prechilling treatments on *Prunus lannesiana* WILS. (CARR.) var. *speciosa*.

Prechilling periods	Treatments of temperature and conditions				
	$3\sim4^{\circ}\text{C}$ storage		$8\sim9^{\circ}\text{C}$ storage		$-5\sim-2^{\circ}\text{C}$ storage
	wet	dry	wet	dry	frozen
1 week	※	※	※	※	※
2 weeks	※	※	※	※	※
4 weeks	※	※	※	※	※
8 weeks	※	※	※	※	
12 weeks	※	※	※	※	
16 weeks	※	※	※	※	
20 weeks	※	※	※	※	

Note 1 : Marked ※ place are experimental design plots.

Note 2 : As these plots are 3 repetitions, each plot are sown 30 seeds with *Prunus lannesiana* WILS. (CARR.) var. *speciosa*.

After these pretreatments, sowed the seeds in plant box under room temperature, checked the germination rate among one month.

Experiment 3

Each plots of experiment 2 was kept in natural climate condition till next spring, and natural germinations rate were investigated in february to may, from starting germination to finishing.

Results

1. Influence of sarcocarp on seed germination

Each germination rate was 0.0% with sarcocarp and 1.1% without sarcocarp. These results were indicated that dropped seeds were in deep dormancy. In this stage, it seemed that seed germination were controled with other factors, not affecting with or without sarcocarp (Table 2).

Table 2 — Germination rate of *P. lannesiana* seeds with and without sarcocarp.

Treatments	with sarcocarp			without sarcocarp		
	1st plot	2nd plot	3rd plot	1st plot	2nd plot	3rd plot
Sown date	June 19th, 1986.			June 19th, 1986.		
No. of sown seeds	30	30	30	30	30	30
Date of investigations	December 19, 1986			December 19, 1986.		
No. of germinations	0	0	0	1	0	0
Rate of germination (%)	0.0	0.0	0.0	3.3	0.0	0.0
Average rate of germination (%)	0.0			1.1		

Note : after sowing, placed at room temperature in plastic house.

2. Influence of frozen storage on seed germination

Storage of $-2\sim-5^{\circ}\text{C}$ plots were not germinated in all experiments. And all frozen storage seeds were rotten, nothing to germinate.

Therefore, *P. lannesiana* seeds were considered to be weak in the temperature of below zero degree centigrade (Table 3 and Fig. 1—8).

3. Influence of prechilling temperature and storage periods on seed germination

Seed dormancy release could be induced to two temperature treatments sufficiently, that is, $3\sim4^{\circ}\text{C}$ plots and $8\sim9^{\circ}\text{C}$ plots.

However, as storage periods, in the case of wet condition storage, dormancy release for seed germination were needed over 12 weeks storage, that is, in $3\sim4^{\circ}\text{C}$ storage plot, 12~16 weeks storage were effective, in $8\sim9^{\circ}\text{C}$ storage plots, 12 weeks storage were effective. But under 4 weeks storage, seed germination were few (Table 3 and Fig. 1—8).

 Table 3 — Effects of prechilling treatments for accelerating early germination rates on *Prunus lannesiana* (CARR.) WILS. var. *speciosa* seeds.

Prechilling periods	Treatments of temperature and conditions				
	$3\sim4^{\circ}\text{C}$ storage		$8\sim9^{\circ}\text{C}$ storage		$-5\sim-2^{\circ}\text{C}$ storage
	wet	dry	wet	dry	frozen
	%	%	%	%	%
1 week	0.0 d	0.0	0.0 d	0.0	0.0
2 weeks	1.1 d	0.0	0.0 d	0.0	0.0
4 weeks	2.2 d	0.0	1.1 d	0.0	0.0
8 weeks	52.2 b	0.0	55.6 b	0.0	—
12 weeks	82.2 b	0.0	81.1 a	0.0	—
16 weeks	74.4 a	0.0	13.3 c	0.0	—
20 weeks	34.3 c	0.0	22.2 c	0.0	—

Note 1 : after removed sarcocarp, prechilling treatments were done.

Note 2 : means no significantly different within same letters by Duncan's multiple range test at 1% level.

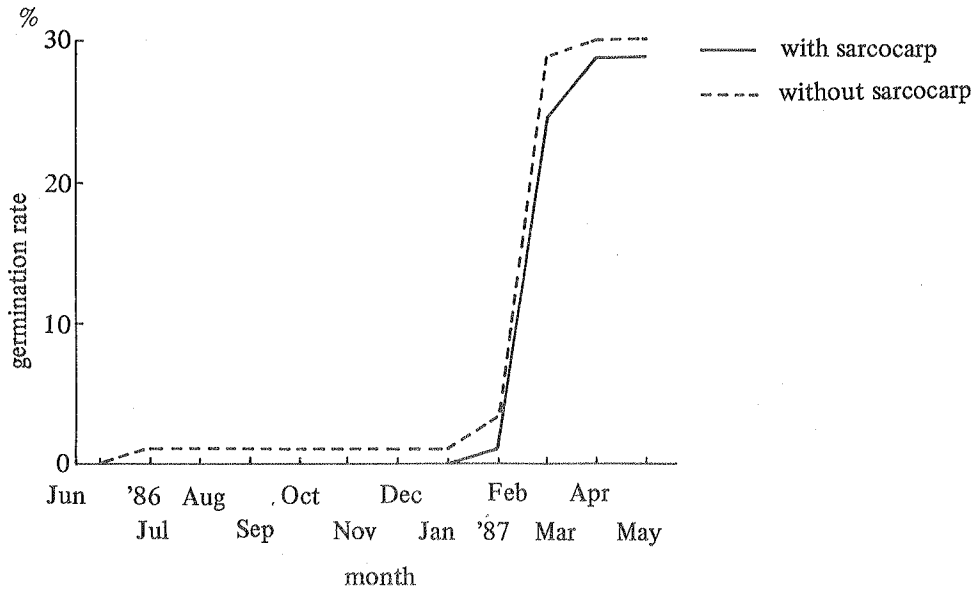


Figure 1 — Germination rate of *P. lannesiana* Wils. var. *speciosa* seed with and without sarcocarp.
Sown at June 19th, 1986.

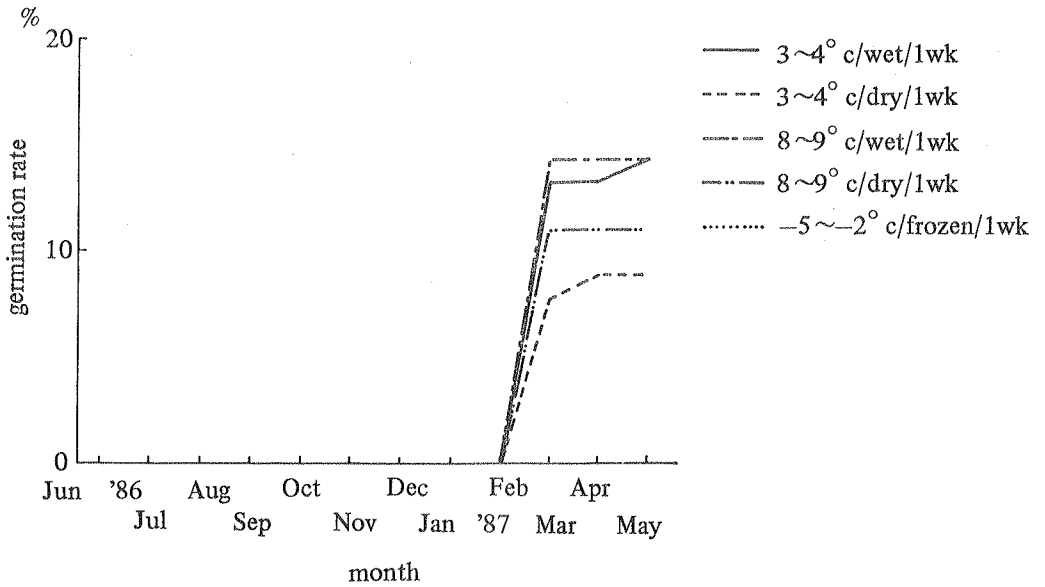


Figure 2 — Effects of prechilling treatments for seed germination on *P. lannesiana* Wils. var. *speciosa*.
Sown at June 26th, 1986 after prechilling treatments.

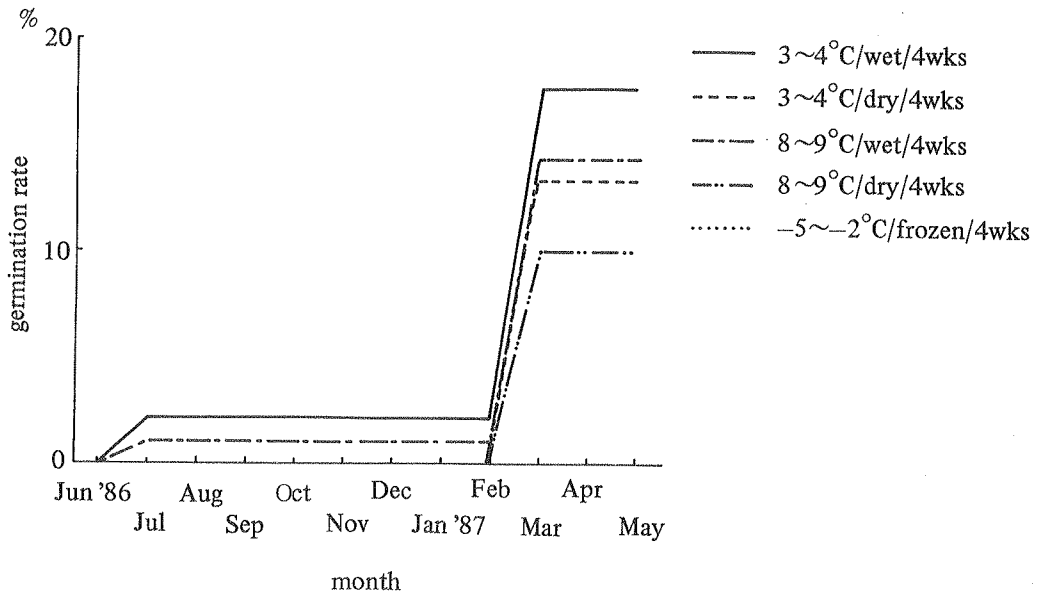


Figure 3 — Effects of prechilling treatments for seed germination on *P. lannesiana* Wils. var. *speciosa*.
Sown at July 3rd, 1986 after prechilling treatments.

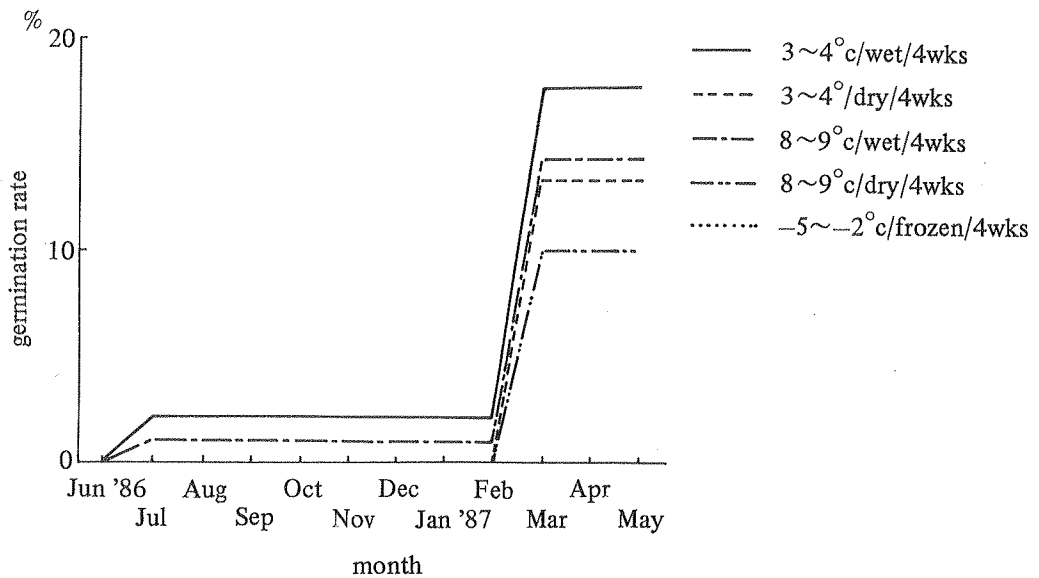


Figure 4 — Effects of prechilling treatments for seed germination on *P. lannesiana* Wils. var. *speciosa*.
Sown at July 17th, 1986 after prechilling treatments.

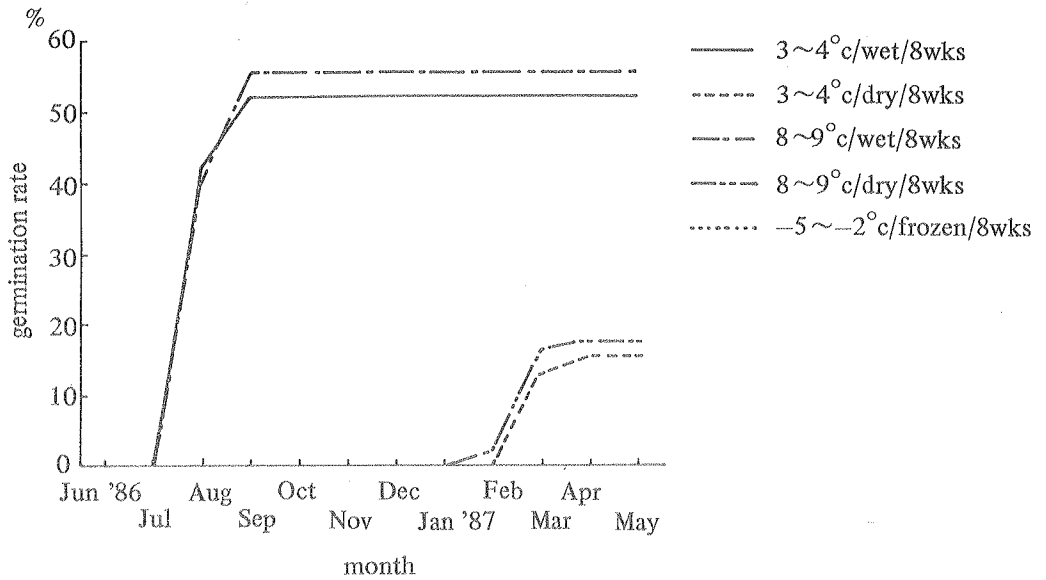


Figure 5 — Effects of prechilling treatments for seed germination on *P. lannesiana* Wils. var. *speciosa*.
Sown at August 14th, 1987 after prechilling treatments.

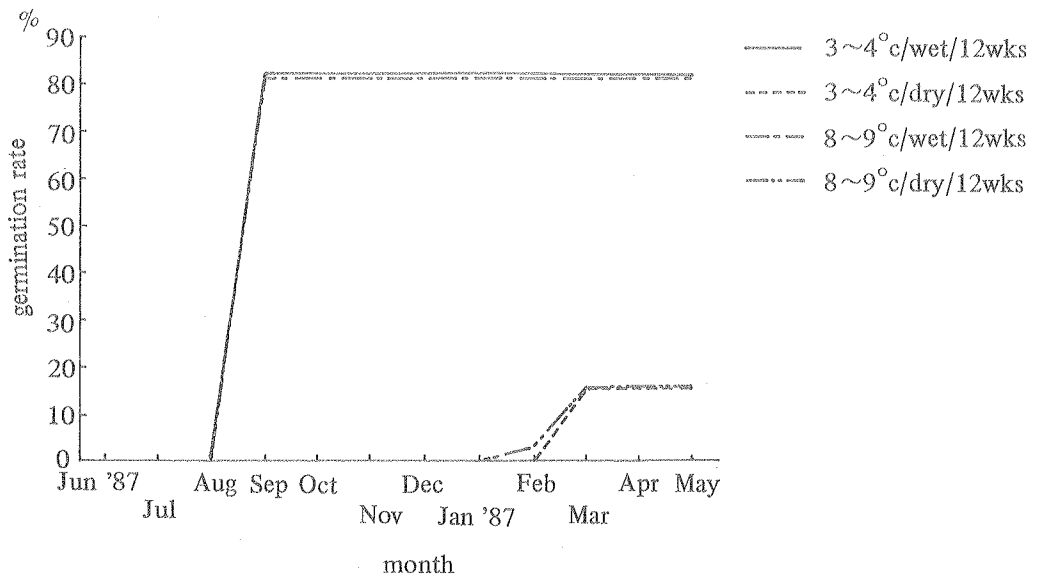


Figure 6 — Effects of prechilling treatments for seed germination on *P. lannesiana* Wils. var. *speciosa*.
Sown at September 11th, 1986 after prechilling treatments.

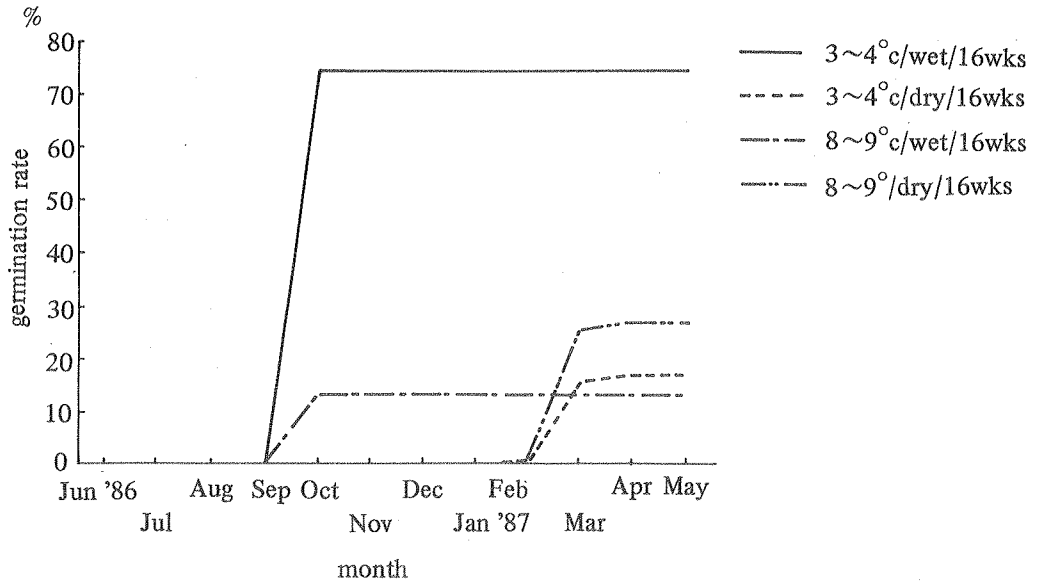


Figure 7 — Effects of prechilling treatments for seed germination on *P. lannesiana* Wils. var. *speciosa*.
Sown at October 9th, 1986 after prechilling treatments.

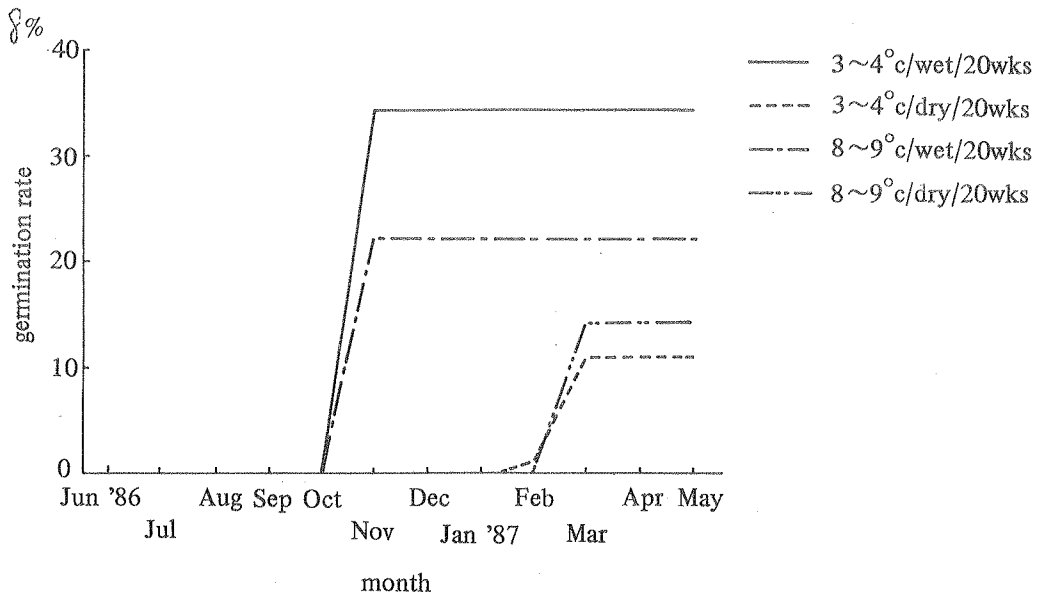


Figure 8 — Effects of prechilling treatments for seed germination on *P. lannesiana* Wils. var. *speciosa*.
Sown at November 6th, 1986 after prechilling treatments.

4. Influence of wet and dry condition storage

In the case of all dry condition storage, all the seeds could not be germinated. This is meaning that wet condition storage is most important of seed dormancy release of *Prunus lannesiana* Wils. var. *speciosa* by prechilling treatments.

5. Optimum storage periods for seed dormancy release

Continuously, investigated these seed germination rates until next may, treatment of over 8 weeks storage in wet condition were not germinated at next spring (Fig. 1-8).

Therefore, seed dormancy release of *P. lannesiana* var. *speciosa* was required over 8 weeks storage periods in wet condition at least. And supposing from these results, optimum storage periods for the seed dormancy were broken up at 8 weeks cold storage ($3\sim 4^{\circ}\text{C}$ and $8\sim 9^{\circ}\text{C}$) in wet condition, but higher early germination rates were expected at over 8 weeks storages of them.

Discussion

Seed germination of *Prunus lannesiana* WILS. (CARR.) var. *speciosa*, is accelerated by prechilling treatments in wet condition of below 10°C ($3\sim 4^{\circ}\text{C}$ and $8\sim 9^{\circ}\text{C}$) and not frozen and 8~16 weeks storages.

And best prechilling temperature is considerable at extremely 0°C and not frozen temperature.

By these results, young plant production of *Prunus lannesiana* WILS. (CARR.) var. *speciosa* could be shortened the cultivation periods about 6~8 months, but time of sowing the seeds after prechilling treatments is august to september, and for coming winter season (cold season) in some months after sowing, the growth will be slow. So that, the continuous growth is needed heating greenhouse or cultivated at warmer areas of the temperate zones and nothing to frost.

In any case, young plant productions of *Prunus lannesiana* WILS. (CARR.) var. *speciosa* will be better improved with prechilling treatments.

References

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オオシマザクラにおける種子休眠の 打破のための低温と貯蔵期間の影響

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概 要

伊豆大島に自生するオオシマザクラ *Prunus lannesiana* WILS. (CARR.) var. *Speciosa* はヒガンザクラ *Prunus spachiana* KITAMURA 以外の花ザクラやオウトウ(実ザクラ)の台木として利用されている。

また その芳香の強さから、塩漬はにした葉をさくら餅の材料として、木質部をハムやベーコンの燻煙材料として利用している。

そこで、ここでは、苗木として需要の多い、オオシマザクラの苗木生産を効率的に行なう目的でその種子休眠を打破するための低温処理を検討した。

一般的に、伊豆大島では、5～6月に採取した種子を、翌年2月末まで土中に埋めて、自然の低温に遭遇させたのち、播種する方法がとられている。

試験結果は次のとおりである。

- 1) 採種直後の播種では、果肉の有無は発芽に直接影響しなかった。
- 2) 種子を-2～-5℃で冷凍貯蔵すると胚細胞が破壊されて発芽能力を失ってしまった。
- 3) 低温処理の効果は3～4℃および8～9℃ともに認められた。
- 4) 乾式貯蔵ではまったく低温感応しなかったが、湿式貯蔵することによって低温感応が促進された。
- 5) 低温感応するためには、少なくとも8週間以上の湿式低温貯蔵期間が必要であった。
- 6) オオシマザクラの種子発芽を促進させるためには、湿式条件下で、3～4℃では12～16週間、8～9℃では12週間の低温処理をすることが最も良い結果を得た。

以上のことから、オオシマザクラの種子発芽は低温処理によって、6～7ヶ月間発芽を早めることができ、苗木生産を効率的に行なうことができると思われる。

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