STUDY ON THE ROOTING CHARACTER OF CUTTING BASED ON TISSUES OF SOME DORMANT HIGHBUSH BLUEBERRY STEMS

by

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ハイブッシュブルーベリー休眠枝の組織からみた挿木発根性に関する研究

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It is known that the rooting percentage of cuttings in dormant highbush blueberry stems can't rise to 100% such as that of grape vines. Even if the cutting conditions were the best, rooting percentage couldn't quite reach 100%. In order to find this reason from tissues of the stem, those of the dormant stem were observed by a microscopic examination.

It was found that a collenchymatous tissue existing in cortex interfered with the emergence and elongation of a root origin formed in pith-rays. Therefore it is necessary to crash through the hard tissue walls by the vitality of root origin elongation. This difficulty seems to be a fatal characteristic for rooting in dormant highbush blueberry stems.

I Introduction

In Japan blueberry growing is almost unknown in general but in the north-east district of North America and in the east or west shore of Canada, production of blueberry fruit is very high, and it is generally used as the material for jam or table fresh fruit. Its quality is excellent and commercial value is high, too.

In Hokkaido blueberry seedlings of several varieties were imported in a past year, but it was only the testing culture. In 1962 a number of seedlings were imported from Canada and the growing test has been carried out since that time.

From this culture it was found to be suitable to peat soil and acid soil, to be divided among five groups based on an ecology and unexpectedly to be difficult on the rooting condition of cuttings. These are the differences from the other fruit trees.

Judging from the above facts, it is thought that blueberry growing is suited to Hokkaido districts occupied largely by peat soil, therefore it will be interesting how to grow and to keep the blueberry field.

It is necessary that the mass production be carried out for diffusion as the first condition. Moreover rooting characteristics in cutting before propagation must be tested. Therefore at first a histological character was observed by microscope.

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II Materials and method

1) Cutting procedure

Dormant stems of three varieties which were picked up from the field in March were cut down to 7–10 cm in length. The stems were disinfected with 0.1 % Difoltan 80 wettable powder for 30 minutes. After being washed in the clean water the end of each stem was cut down just beneath the bud and the base of it was covered with Rooton powder. The treated stems were each put into an 8 cm diameter peat pot filled with peat moss. After being put into the peat pots one per pot, mist-irrigation was practised at definite intervals for 50 days. The rooting condition was observed at the end of October.

2) Tissue observation

Tissues of dormant stem put to use in the above cuttings were tested by microscope observation.

A number of cross sections of the stem with free hand were taken. Parenchymatous cells were colored with natural red, on the other hand collenchymatous cells with 5 % phloroglucin and conc. HCl. In order to compare with the tissue of grape vine, Campbell Early was sellected and was observed by the same procedure as that of the blueberry stems.

III Results and discussion

Actually the rooting percentage in the stem of dormant highbush blueberry is not so high as seen in Table 1 and Table 2. There are differences in each variety. The effectiveness of a promoting medicine for rooting is not generally remarkable except in Pemberton variety. There are some individuals which occur only calus emergence without rooting at the end of the stem. If they are put into the ground in the next year, the emergence of roots will always

Table 1 Rooting percentage of cuttings in blueberry stem (1966)

Variety	Treatment	No. of cutting	No. of rooting	Per. of rooting	Length of growing shoot over ground
Jersey	none	11	8	73 %	7.6 cm
	Rooton	11	9	82	10.7
Pemberton	none	12	1	8	9.0
	Rooton	12	8	67	9.9

Table 2 Rooting percentage of cuttings in blueberry stem (1969)

Variety	Treatment	No. of cutting	No. of rooting	Rooting percentage	No. of callus made only (none rooting)
Stanley	none	13	5	39	2
	Rooton	13	7	54	2
June	none	11	3	27	0
	Rooton	11	6	55	2
Rancocas	Lanolin and Rooton	9	4	44	6
	Lanolin and Shave	9	3	33	3

occur.

Everybody will maintain that there are many different cases, such as variety, part of stem used, cutting time, and its method so on as the rooting environment. Judging from the total view, however, it is clearly not so easy as that of grape vine. What cases do exist there? When the rooting percentage is not always high in spite of giving the best condition, it is thought that the tissue of highbush blueberry stem is different from that of grape vine. So a histologycal comparison with blueberry stem and grape vine was carried out under the microscope as seen in Fig. 3 - Fig. 4.

At the first pith-rays in the tissue of blueberry stem have slenderly continued with 1 or 2 layers of cells. Sometimes the pith-rays containing 3 or 4 layers of cells have mixed among the slender ones every 4 - 6 rows.

In grape vine a root origin in tissues has been formed in any pith-ray of cortex, but in blueberry stem the root origin formation is not the same as that of grape vine. It was observed that root origin was not formed at the slender pith-ray such as 1 - 2 layers of cells but was done at 4 - 6. Therefore the chance of forming root origin of blueberry stem is far fewer than that of grape vine.

Secondly the following fact was recognized:

A group of collenchymatous cells (to be said as hard tissue afterwards) is covering the exit where root origin comes to develop. (See Fig. 3) Therefore, even if a root origin developed to the top of pith-ray, it couldn't get out of the pith-ray by the interference of hard tissues, the emergence of root is found for the first time. It is not clear that a vitality which breaks down a hard tissue occurs in any case. Therefore it will be guessed that the rooting chance may be smaller to some degree in the second case.

Is there any artificial method for rooting of the dormant stems? In cutting the base of each stem was longitudinally sliced off with a sharp knife in order to break down hard tissue, but the rooting percentage was almost no different from the control. This practice seems to be a good idea, but in regard to the chipping method, it means that it is difficult to slice off suitably. In the future, moreover, the best technics for breaking the hard tissue of cortex must be thought out. There are no problems in the rooting character of grape vine. This is due to the fact that the root origin can freely get out of pith-ray without any other interference. (See Fig. 4) So green shoots in blueberry cutting were used with mistirrigation. According to this test, it seems clear that the rooting ability of green shoots is larger than that of dormant stems of the same cutting. But the cutting in this case should be done before the hard tissue in cortex is completed. In Hokkaido the end of July is the optimum time for green shoot cutting. The later this period is, the lower the rooting percentage is because it is related with tissue formation time.

IV Conclusions

The rooting percentage of dormant highbush blueberry stem is unable to reach 100 %. Judging from this tissue, this fact seems to be clear. The reasons are as follows:

1) There are many chances which deal with tissue made from 1 or 2 layers of the pith-ray of cortex, in which the root origin doesn't emerge, but a few cases which have 4 or 6 layers of pith-ray, in which root origin

often emerges.

2) Even if the root origin emerged and developed to the top of pith-ray, it would be difficult to break down the hard tissue of cortex. The poor rooting percentage, therefore, may be a fatal characteristic for dormant stem. But this percentage will be better than that at this time if a method of breaking down the hard tissue is discovered in the future. If a great number of seedlings of blueberry are required, continuing tests must be done in the future.

References

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摘　　要

ハイブッシュブルーベリーの休眠枝の挿木は現在のところ100％まで発根率をあげることはできない。これをブルーベリー枝の組織から判定すると，次の2つの大きな理由が考えられる。

1) 根源体の発生されるべき靱皮射出ずいが1～2層のものが多く，ここでは根源体が発生されない。4～6層の厚い部分で根源体の発生が見られた。しかもこの層は細い射出ずいの間に4～5列をおいて散在されるに過ぎない。従ってブドー枝のようにどの射出ずいからも根源体の発生するのに比べて，そのチャンスは少ない。

2) 根源体が発生して，これが射出ずいの先端まで移動してきても，その頂部に(写真-3) 硬組織が邪魔しているため，これを打破することが困難なようである。うまく硬組織を破って出た時にはじめて発根ということになる。このように発根性が組織によって影響されることはむしろブルーベリー休眠枝の宿命的特性とも考えられる。

しかし今後は実際の挿木において，靱皮硬組織をいかにして人工的に破り得るかということが問題で，その技術がわかれば発根率は当然上昇するであろう。なお今後は靱皮硬組織が形成される前の緑枝の挿木が期待できる。

Fig. 1 New shoots developed from blueberry stems put into peat-pots.

Fig. 2 Rooting condition of stem.

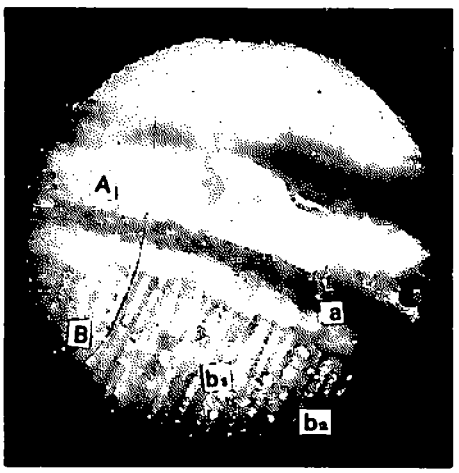

Fig. 3 Cross section of blueberry stem.

A : Cortex

B : Xylem

a : hard tissue

b_1 : wide pith-ray

b_2 : slender pith-ray

Fig. 4 Cross section of grape vine.

A : Cortex

B : Xylem

a : hard tissue

b : pith-ray