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THE RAISING OF FIRST YEAR POTATO SEEDLINGS IN GLASSHOUSES

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1. Introduction

At the Potato Breeding Station of the Foundation for Agricultural Plant Breeding, Marknesse, a new method of raising potato seedlings is being used which has drawn the attention of potato breeders.

The author gives details about the raising of potato plants from seed in glasshouses in order to obtain virus-free starting-material for the breeding work.

2. The old method

It is possible to sow potato seed successfully in the open on nursery beds and to raise plants from them that can be assessed for their potential qualities in the first year.

Because of the high susceptibility of the potato to frost the work was transferred under glass, pricking the plants out in pots after which the hardened plants are transplanted into the open as soon as danger by frost is past.

In the Netherlands the greater part of some 350.000 first year seedlings are planted in the open after May 15th and the plants are lifted as early as the middle of July in order to prevent contamination of the tubers with virus. The foliage is still green then and at this stage they are tested as far as possible for certain properties.

3. The new method

On the Prof. Broekema farm, the potato breeding station of the Foundation for Agricultural Plant Breeding, another method of raising has been used for the last five years.

The seedlings are sown in glasshouses (Fig. 1) and stay there (planted in pots) until they are ready for harvesting. Contamination with virus is prevented by fumigation with nicotine or parathion twice a week (Fig. 2).

From the harvested tubers, second year seedlings are grown in the field the following year. They are considered as first year seedlings, however, since they are not grown from true seed, but from the small tubers which grew from seed in the glasshouses during the first year.

In order to exploit the glasshouses as economically as possible, two generations of seedlings are raised yearly.

As potato seedlings require about 4 months to grow from seed to a full-grown plant, an even more intensive use of the glasshouse might be possible, but this would require too great an expenditure on heating and artificial lightning-equipment. So only two crops are raised

The first sowing is made towards the end of January. In a small heated glasshouse

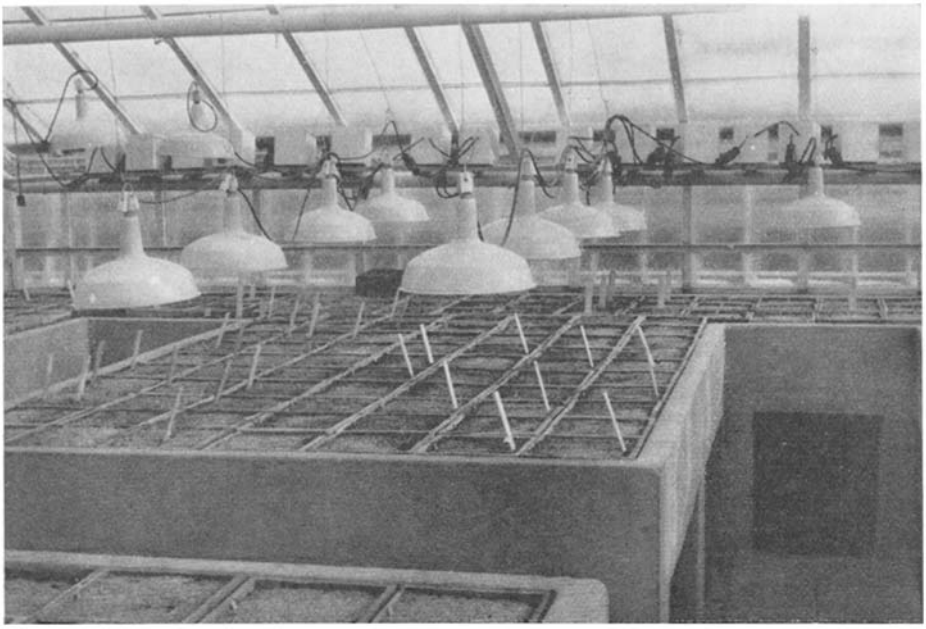

FIG. 1. AFTER EMERGENCE OF THE SEED EXTRA LIGHT IS GIVEN BY MEANS OF HIGH TENSION MERCURY LAMPS

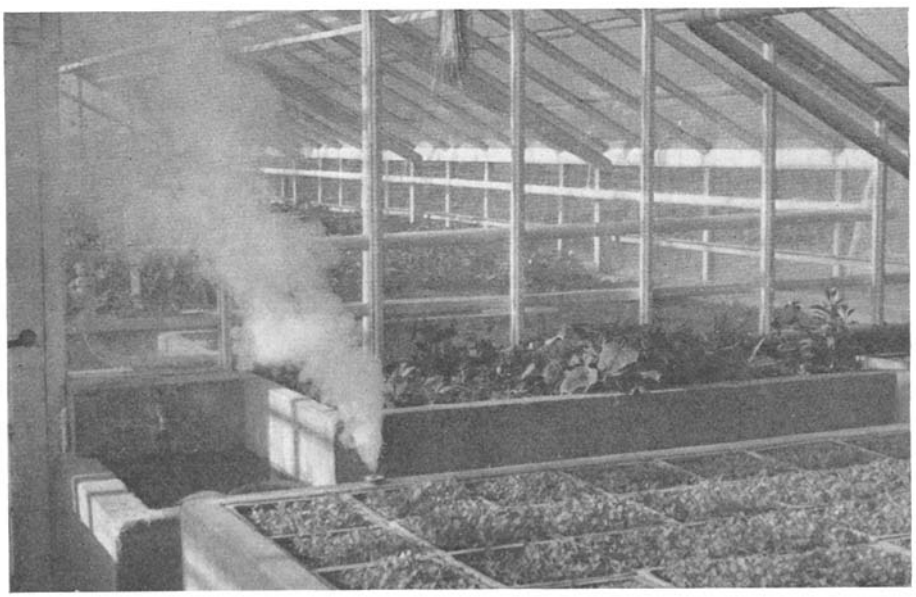

FIG. 2. CONTAMINATION WITH VIRUS IS PREVENTED BY FUMIGATION WITH NICOTINE OR PARATHION TWICE A WEEK

about 90.000 seeds are sown to obtain 60.000 plants for large glasshouses of 32 × 10,5 m [1]).

After emergence extra light is given by means of high tension Mercury lamps from 4 till 9 a.m. One lamp of 125 W hung at a height of $\frac{1}{2}$ m is used to irradiate 1 m^2 (one square meter).

Under these circumstances strong plants are attained which are planted in pots in the glasshouses towards the end of February. These pots with an outside diameter of 10 cm are placed (without soil) in fine moist peat (Fig. 3) and afterwards filled with a rich compost.

From now on no extra light is given and in the glasshouses which are slightly heated, the plants (Fig. 4) grow up to a height of 25–30 cm. This is sufficient for the formation of tubers of about 2 cm diameter (Fig. 5).

The usual differences between the progeny plants of one cross, such as differences in maturity, stolon-length, tuber colour, shallowness of eyes, and shape and size of the tubers appear to be present at this stage, so that a selection for some characters can be made.

Special attention is paid to stolon-length, shallowness of eyes and tuber-shape, since it has appeared that the glasshouse seedlings can be successfully selected for these characters.

The percentage of plants being kept fluctuates between 20 and 90 % in selections but on an average this is some 60 %.

Only one tuber, the largest, of each plant is usually kept and the tubers of each crossing are put in a separate tray (Fig. 6).

These small clones which are harvested in May or June and which must not be planted before April of the following year, are stored in an electrical refrigerator at a temperature of 4° Centigrade.

About a month before the lifting of these seedlings we sow for the second time to raise plants that are placed as a "second crop" in the pots (of their predecessors) which were again filled with soil.

These plants are harvested in October or the beginning of November. The clones which have been grown from these plants are not placed in the refrigerator, but in a store with outside air cooling, where from the end of November till the beginning of March a temperature of 2–4° Centigrade can be maintained.

All clones are then stored at a temperature of 8–10° Centigrade until the middle of April when they are again planted.

By irradiation with TL-tubes, strong sprouts are produced which guarantee a good emergence.

4. Results

As mentioned above, by the use of glasshouses virus-free tubers can be obtained from seed. These tubers, after a preliminary selection, can be planted in the field in the following year.

This method has great advantages.

[1]) If certain sowings must be inoculated with *Phytophthora infestans*, the number of seeds is much larger, of course.

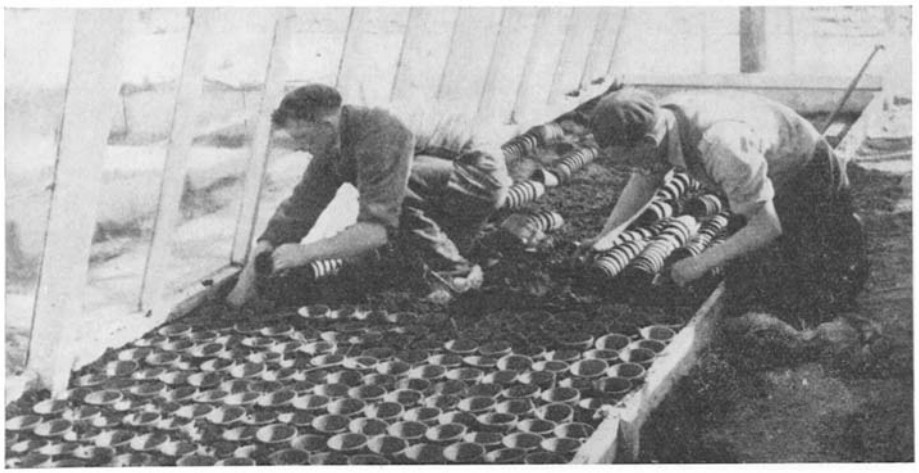

FIG. 3. ARRANGEMENT OF THE POTS FOR THE PLANTLETS

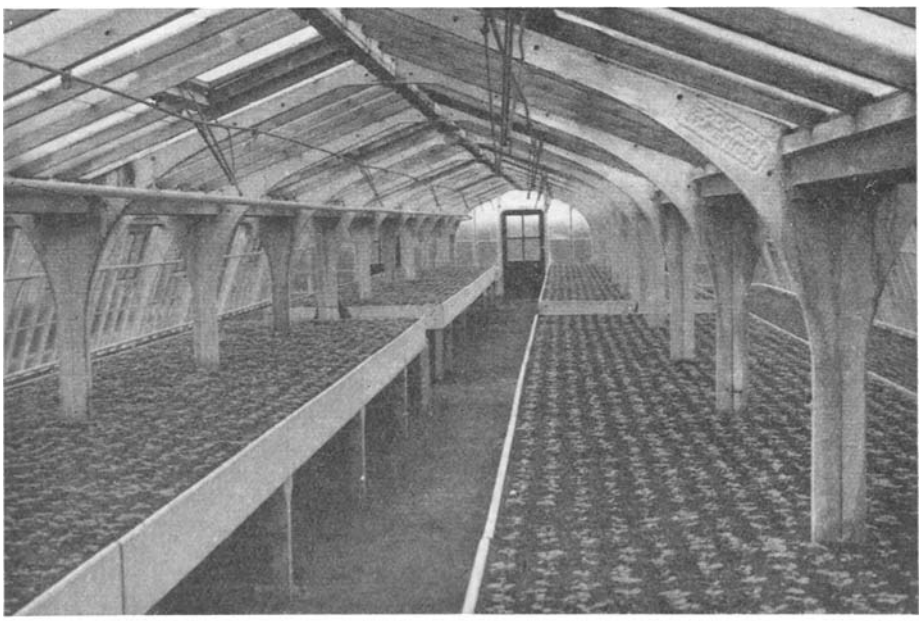

FIG. 4. SURVEY OF THE INTERIOR OF A GLASSHOUSE

a. From a seed a plant develops with a main root and laterals, so that one can actually speak of a plant.

A plant, however, which grows from a potato tuber develops in a quite different way. From one tuber various eyes grow out to stems with adventitious roots which, though originating from one tuber whichs acts as a preliminary source of food, should really be considered as a separate group of plants which are growing up very close to each other.

This way of growing is that of a normal potato cultivation and the assessment of the seedling's value is much more efficient than from plants that were directly grown from a seed.

b. Seedlings, growing from seed, cannot be planted in the field early because of the possible occurrence of night frosts.

The seedlings, however, which are grown from a tuber, are soon planted and consequently grow quickly to normal plants with fairly large tubers, which can be lifted extra early and selected promptly.

The chance of losing good plants in roguing is reduced to a minimum, while conversely the oppertunity to discover valuable seedlings is increased.

c. As the tubers of seedlings which have been grown from clones are much larger than those grown from true seed, much larger second year seedlings develop from these larger tubers the following year and consequently they can be judged better.

d. As we raise our first year seedlings from virus-free glasshouse clones and can lift them early because of their early development, the second generation is but very slightly handicapped by diseases.

Against this we lose one year i.e. that of the formation from seed to clone. This can be a hindrance in certain crosses, but it is no impediment in the usual breeding work.

If we consider the loss of a year in certain crosses too great a drawback, we bring the seedlings with as much potting compost adhering to the roots as possible into the field in the first year, according to the old method.

We can also sow very early, in the beginning of January, and harvest in April, break the dormancy of the largest tubers by treating them with Rindite and planting them in the field in the beginning of May. In this way it should be possible to gain a year. This method is being tested for the first time, however, so that no results are available so far.

We already have stated that the largest tuber of a glasshouse clone is generally kept, but of course it is also possible to keep all the tubers of a clone – on an average three – and to plant them the following year. This means extra work in harvesting the glasshouse clones – which must be kept separate – and a threefold amount of space and work in the field.

This causes difficulties, especially with a large establishment, and we have stopped this procedure after a preliminary trial and work now principally with one tuber of each seedling.

Some 40.000 of our glasshouse clones are yearly distributed to Dutch breeders who sometimes replace their own seedling-production from seed by clones. The more difficult raising from seed is then carried out by our breeding establishment.

Many breeders who want to plant more clones than our establishment can supply, are growing clones from seed in their own or in hired glasshouses according to the above mentioned method.

It is apparent that the method of glasshouse clones is being appreciated by the breeders.

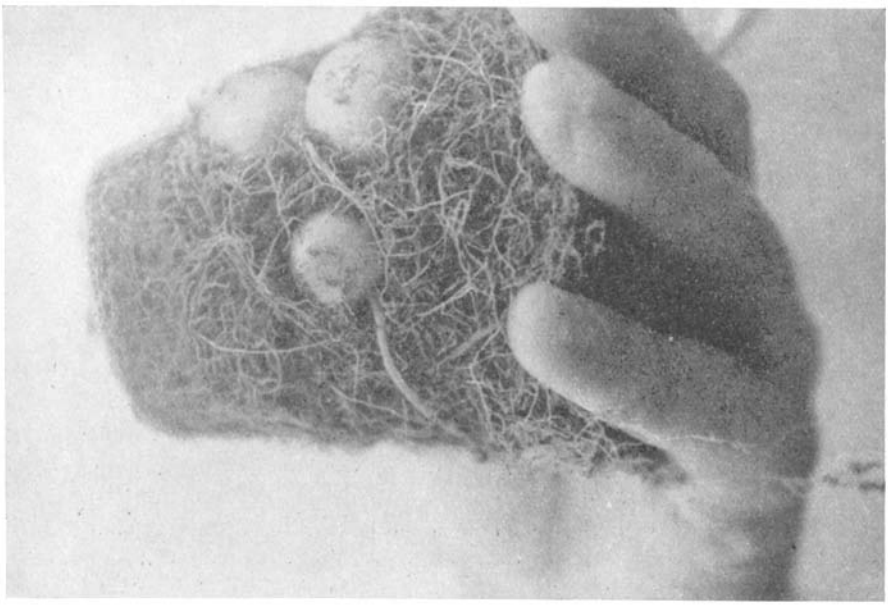

FIG. 5. POT-BALL OF A FULLY DEVELOPED SEEDLING

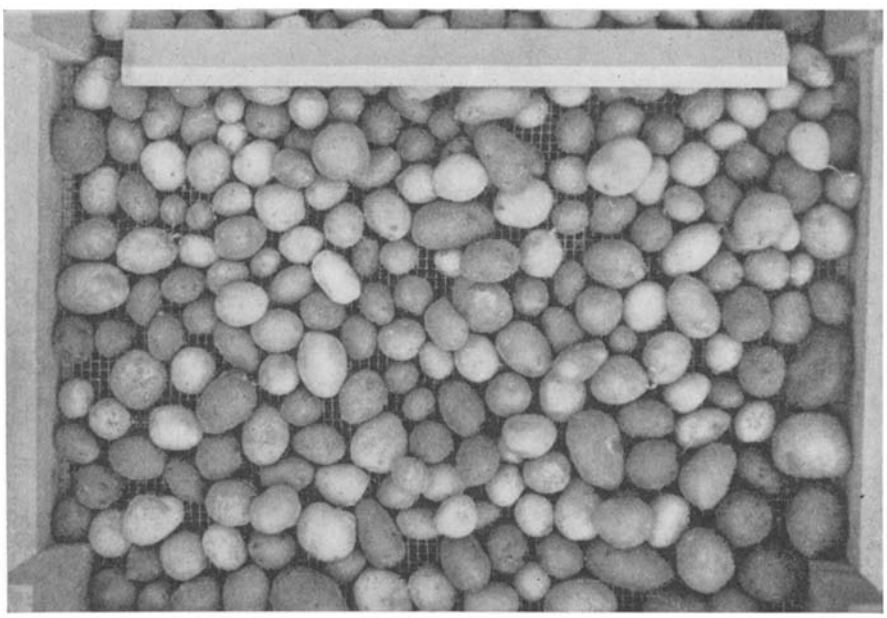

FIG. 6. TUBERS OF ONE CROSS. EVERY TUBER IS THE LARGEST OF ONE CLONE. THE RULER IS 50 CM LONG

SUMMARY

The raising of potato seedlings in glasshouses leads to very favourable results.

Healthy plants develop from virus-free clones the following year and they can be promptly selected for several characters at harvest time in July.

This possibility of a prompt selection in an early stage of breeding is considered very important and is highly appreciated by the breeders.

The pre-raising of potato seedlings to one-tuber clones in the first year is rapidly spreading in the Netherlands.

SAMENVATTING

De voor-opkweek van aardappelzaailingen in kassen

De voor-opkweek van aardappelzaailingen in luisvrije kassen geeft zeer goede resultaten, doordat een zaailing, groeiend uit een kloontje beter te beoordelen is dan die welke het eerste jaar uit een zaadje op het veld opgroeide. De selectie in een klonenveld is veel grondiger uit te voeren.

Door een betere en vroegere selectiemogelijkheid in het eerste veldjaar is het aanhoudingspercentage der tweedejaars-zaailingen gemiddeld hoger dan bij de oude werkwijze.

Door de distributie van deze klonen is de S.V.P. bovendien in de gelegenheid de kwekers op een gemakkelijke manier te helpen aan goed uitgangsmateriaal voor hun kweekwerk.

Vooral door genoemde voordelen heeft een snelle uitbreiding van het gebruik van kasklonen plaats.