

CERTIFICATION SCHEME FOR FRUIT TREES IN GERMANY AUGĻUKOKU SERTIFIKĀCIJAS SISTĒMA VĀCIJĀ

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Kopsavilkums

Pēc 2. pasaules kara Vācijā izveidoja atveseļota stādāmā materiāla audzēšanas sistēmu. Tika pierādīts, ka vīrusbrīvi stādi dos labāku ražu, ir izturīgāki pret stresa apstākļiem un pārstādīšanu salīdzinājumā ar inficētiem. No 1978.gada vīrusbrīva stādāmā materiāla lietošana bija noteikta kā obligāta. Kopš 1992.gada, Vācijai pieņemot Eiropas likumdošanu, noteikumi tika atviegloti. Rakstā sniegts Vācijas kokaudzētavu situācijas raksturojums un atveseļota stādāmā materiāla audzēšanas sistēmas izklāsts.

Abstract

After World War II a programme was started in Germany for the selection of healthy efficient mother trees for the further propagation of rootstocks and scion cultivars. It was shown that virus-free trees showed better compatibility, growth, yield, fruit quality than infected ones. Also they proved to be more tolerant towards stress and replant problems. Therefore it was ensured that mother plants became virus-free. From 1978 onwards the usage of virus-free planting material was compulsory. However, this decree was softened by a new European Union order in 1992 giving the growers free choice for certified plant material or material of minor health status. For quick marketing of new cultivars i.e. clonal material it allows to propagate planting material from mother plants of which the origin is known and which are true to cultivar, healthy and free of symptoms caused by pests and diseases. Therefore only visual tests have to be passed. With this procedure there is no guarantee for freedom of latent infections by economically important virus and phytoplasma diseases. In the paper statistics are given about number of nurseries and the annual fruit tree requirement of Germany. Procedures of mother plant selection, of virus elimination and certification are described. Finally data are given about the advantage of using virus-free planting material for sustaining yields and high fruit quality.

Introduction

With the intensification of fruit production after World War II, nurserymen and fruit farmers became aware that a main prerequisite for high yields of quality fruit would be the planting of healthy, efficient fruit trees. Since then a programme started for the careful selection of healthy, efficient mother trees for rootstock and scion cultivars, producing high yields of quality fruit. Moreover, viruses were eliminated by heat treatment and or meristematic tissue culture. From 1978 onwards the usage of virus-free planting material was made compulsory. In July 1992, the former, German legislation for the establishment of virus-free planting material was softened by a new European order giving the growers free choice for certified plant material or material of poor health status. However, for sustaining of competitive orchards only virus-free certified plants are recommended. The procedures of mother plant selection, of virus elimination and of certification are described in the paper.

Nurseries in Germany

In Germany nurseries for the propagation of rootstocks, fruit trees, ornamental shrubs and forest trees had a total area of 21,413 ha in 2004. Among others the area for rootstock propagation amounted to 7,535 ha, for fruit tree propagation 1,049 ha, ornamental shrubs 11,310 ha, forest trees 2,519 ha. There were 3,398 nurseries employing 32,500 people. In 2004, 29,506,000 fruit trees were produced indicating a slightly increasing trend for fruit tree production as compared with previous years. The imports of woody nursery plant material amounted to 140 million Euro and the export to 58 million Euro. The total production value for fruit trees was 1,3 billion Euro in 2004.

Selection of mother plants

Fruit tree cultivars mutate relatively easy, particularly in apple and pear, but also in *Prunus* species. Over a period of time, this may result in a decline of health yield efficiency and fruit quality. Similarly, this may also apply to rootstock cultivars. Therefore in Germany, especially in viticulture,

selection work within the main cultivars has been practised for more than 50 years to obtain high quality mother plant material. So far the selection was bound to experimental plots, where records about growth, yield and fruit quality characteristics are taken regularly. An example is shown in Figure 1 for the selection of mother plants for the propagation of a vine cultivar.

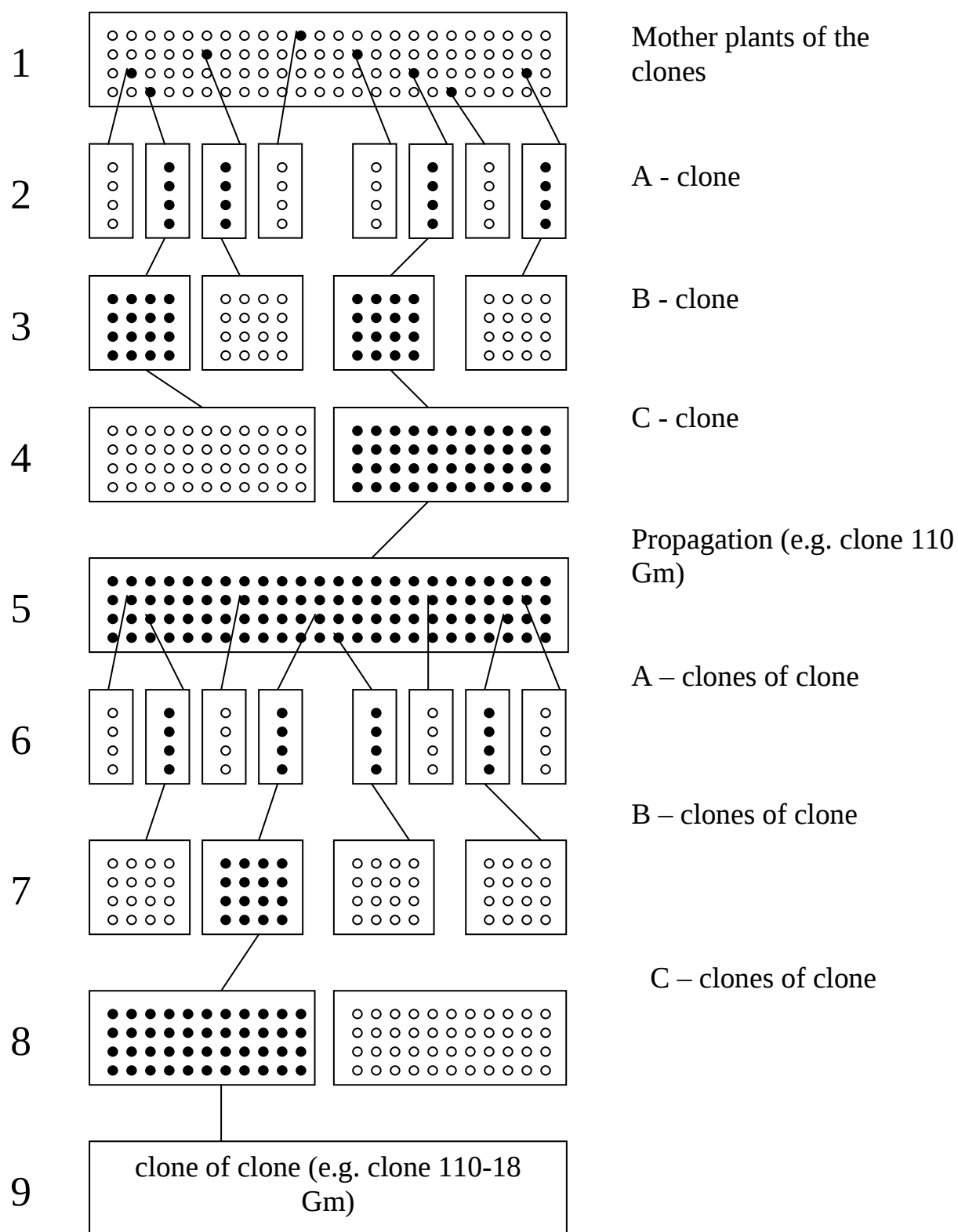


Figure 1. Scheme of the Geisenheim clonal selection: Selection of a clone out of a clone with proven good performance (e.g. ‘Weiser Riesling’ clone 110 Gm, clone 110-18 Gm, out of (5))

For the evaluation of the selected plant material the following characteristic are considered for the scion cultivars: growth parameters, yield and quality of fruits, health status, nutrient use efficiency, resistance or tolerance against diseases, pests and frost.

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For the selection of mother plants for the vegetative propagation of rootstocks the following characteristics are mainly considered: growth parameters, rooting ability, compatibility, adaption to the planting location.

Procedures of virus elimination

The selected so-called candidate scion or rootstock material is grafted on virus-free seedlings grown in containers filled with a sterilized substrate. For virus elimination, the candidate plants are kept in a growth chamber for about 6 weeks at temperatures of 38° C during the light and 36° C during the dark period. The shoot tip of the heat treated plants is either grafted onto a virus-free rootstock or propagated by tissue culture, the graft is protected with a plastic bag to maintain high humidity in the surrounding atmosphere.

The plant is grown then in a Saran-House to avoid any virus transfers by aphids. To be certain that the candidate mother plant is really free of virus, several HouseVirus tests are required during the following years (Fig. 2). These are done with indicator plants or with the help of Immun-Assay-Test. In addition also PCR-tests are used. The procedure to get high quality certified mother plants may last up to 5 – 12 years, depending on the number of tests required.

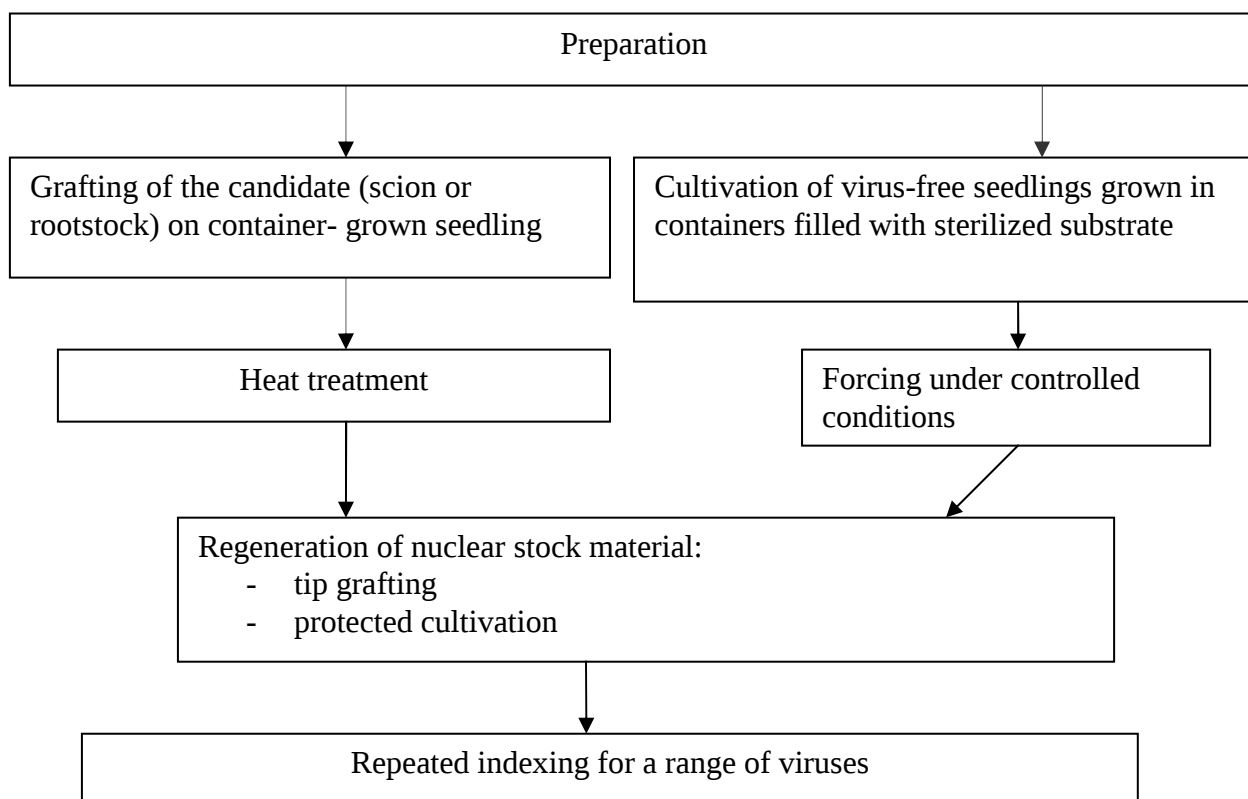


Figure 2. Procedure of virus elimination

The viruses in pome and stone fruit are named, which become eliminated by the above mentioned procedure, are named below:

- apple: Apple chlorotic leaf spot, Apple mosaic, Apple stem grooving, Apple stem pitting, spy epinasty and decline, platycarpa scalybark, Apple rubbery wood, Apple flat limb, Apple rough skin, Apple star crack, Apple proliferation; Pear and Quince: Apple chlorotic leaf spot, bark split, rough bark, Bark necrosis, rubbery wood, Pear vein yellows/red mottle, stem pitting, Pear stony pit, Quince sooty ringspot, Pear decline; Cherry: Apple chlorotic leaf spot, Apple mosaic, Prune dwarf, Prunus necrotic ring spot, Cherry leafroll, Little cherry, Raspberry ringspot, Rusty mottle, Cherry green ring mottle;

- plum: Apple chlorotic leaf spot, Plum bark split, European plum line pattern, Apple mosaic, Prune dwarf, Prunus necrotic ring spot, Plum pox.

To speed up the establishment of virus-free mother plants soon after heat treatment, virus-free rootstocks are already budded with material from the pre-basis mother plants. These are planted into the field and become certified mother plants when it has been proved that they are virus free. The location for the certified virus-free mother plants should be free of nematodes and about 1 km away from the next orchard to reduce the danger of reinfection with virus.

Certification

There are two categories of fruit tree planting material on the market, providing the so-called "standard" as well as certified material.

CAC (Conformitas Agraria Communitatis) material

Standard material proved to be necessary for nurseries and farmers, who like to be quick on the market with promising new cultivars and interesting mutations of special main cultivars and don't want to wait for years until it is certain that mother plants are virus-free.

Therefore, the European Union decree about the marketing of fruit tree planting material was less strict than the original German decree for the establishment of high quality virus-free fruit trees. It allows the marketing of plant material derived from mother trees of which the origin is well recorded. The material has to be true to cultivar. It has to be healthy according to visual tests and apparently free of the main viruses and pathogenes. The fruit trees ready for the market are certified with a white label indicating the country where produced, the species, cultivar, rootstock and the number of the plant passport according to the EU regulation.

Certified virus free fruit trees

If it has been proven that the pre-basis mother plants are really virus-free, then the descendants in the field can be certified if grown in soil free of nematodes and isolated about 1 km from the next orchard to reduce the danger of virus reinfection. However, these certified virus-free mother plants should not be used for longer than 8 years for the supply of scion wood. At annual intervals mother trees should be tested at random if they are still free of virus and other pathogens (Fig. 3).

If nurseries establish young fruit trees using rootstocks and scions from certified virus-free mother plants, then the young trees can be labelled for the market as certified virus-free. The red label has a code, name of species, cultivar and rootstock. The label also serves as a plant passport when treated within EG countries.

Apart from the fact that the nursery plants are true to cultivar, healthy and virus-free they should have a high standard in regard to growth, feathering and root the system. General demands for nursery plants:

- legal regulations (e.g. EU guidelines) have to be fulfilled;
- fruit trees propagated by *in vitro* methods have to agree with the demands specified for fruit trees propagated by conventional methods.

Demands for apple trees:

- apple bushes have to be grafted on rootstocks propagated vegetatively.

Demands for knipp trees:

The one-year-old tree must have been cut back to a minimum height of 60 cm above soil level. Minimum number of branches: 5, equally arranged, homogenous in size, minimum length: 20 cm. Central leader with minimum length of 50 cm and minimum diameter of 9 mm.

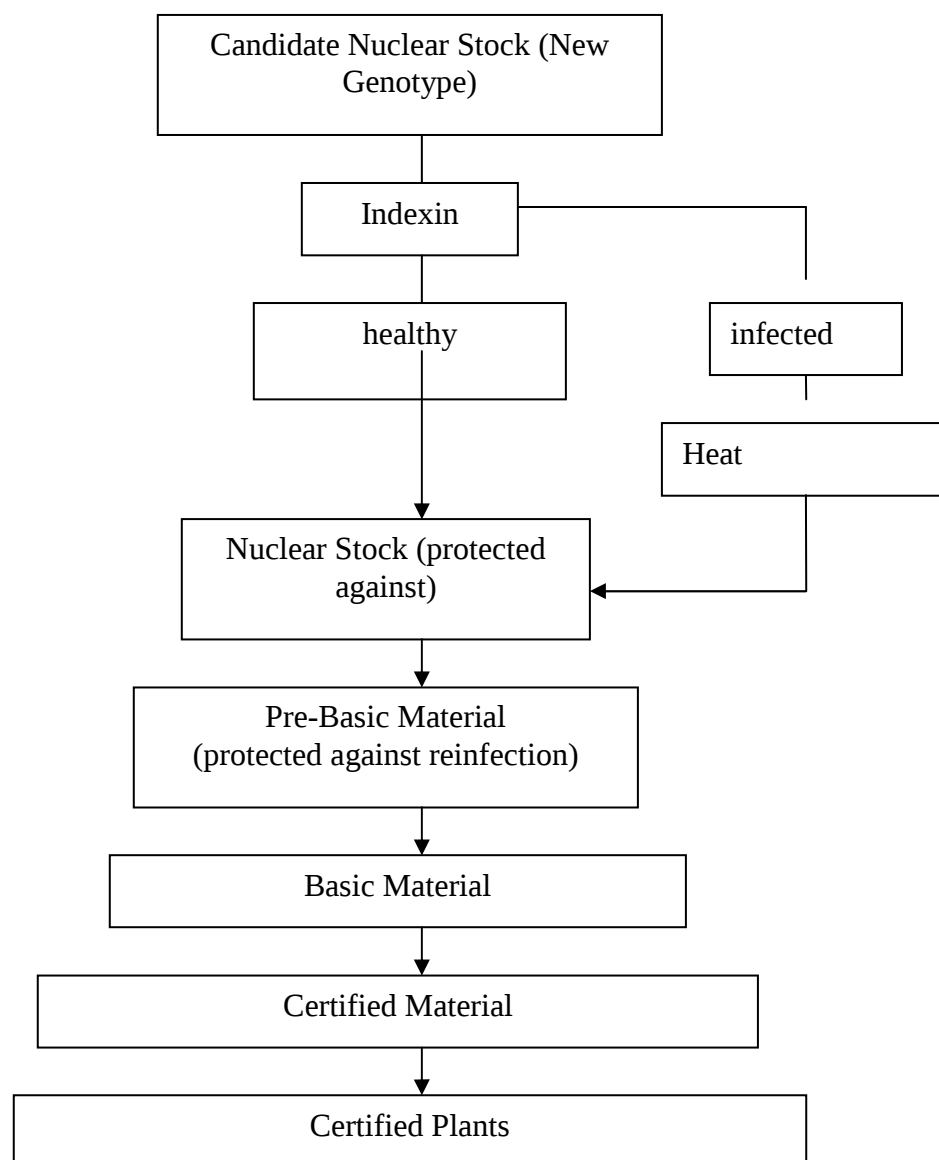


Figure 3. European Union certification scheme

The Department of Agriculture approves the application to multiply virus-free fruit tree material and controls the nurseries.

Obligations of fruit tree nurseries

The fruit tree nurseries have to regularly control the status of trees to investigate possible pest and disease infections. They have to keep records about the type and numbers of trees grown and traded and about infections and pests as well as spray applications. The nursery producing certified fruit trees has to be registered at the Division of Plant Protection of the Department of Agriculture. Nurseries propagating certified trees are inspected at intervals by members of the Division of Plant Protection.

The advantage of virus free planting material

There are many examples, indicating that virus-free planting material even in comparison with plants only free of main virus are better in growth, feathering, and rooting. They therefore more easily overcome difficulties due to replanting problems, drought and other stress factors (Tab. 1).

Table 1. An impact of health status on the performance of replanted 'Cox Orange' until the 7th year

Parameter	Virus-free	Virus-tested	Infected
Stem diameter (m)	5.6	5.5	4.3*
Accumulated yield (kg/tree)	64.6	44.3*	29.2*
Fruit weight (g/fruit)	133	126	110*

*LSD, $p=0.05$

They produce more regular, increased yields of high fruit quality, may be also due to improved water and nutrient use efficiency (Table 2).

Table 2. Interaction between health status and planting density as affecting yield and fruit size replanted 'Jonagold' on M.9 until the 6th year

Parameter	1700 trees/ha		2600 trees/ha	
	Virus-free	Virus-tested	Virus-free	Virus-tested
Accumulated yield (t/ha)	100.5	71.0	111.0	100.0
Fruit weight (kg/fruit)	205	188	197	176

Virus-free fruit trees are superior in: compatibility, growth and branching; yield and fruit quality; tolerance towards different stress factors including replanting problems; sustaining production, duration of the orchard.

However, it also has been reported that such certified virus-free trees may show vigorous growth with delay of crop production. If the mother plants are cut back too strong for obtaining scions, then it may happen that from some buds of the new appearing shoot develop growth of juvenile character.

Conclusions

Careful selection within cultivars for health, high yields of quality fruit and virus elimination is prerequisite to obtain mother plants providing efficient healthy and planting material for competitive new orchards. Unfortunately this is not always recognized and sometimes superficially practised. This is so, because new European regulations allow trading with only visually controlled CAC plants. The aim of all European countries should be that fruit tree nurseries provide enough certified virus free plants for all plantings to come.