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# IMPROVEMENT OF THE CHERRY VARIETIES USED IN THE NETHERLANDS

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## INTRODUCTION

The cherry is a fairly important fruit crop in the Netherlands. As regards its acreage it ranks third with 4321 ha (1953) i.e. 7 % of the total fruit area (apple 66 %, pear 21 %, plum 6 %). From 1950 to 1953 arrivals at the auctions averaged 16.7 million kg with a value of 7,850,000.— guilders i.e. respectively 3.7 and 8.5 % of the total of the 4 fruit crops (apple 63.4 and 59.9 %, pear 27.1 and 25.8 %, plum 5.8 and 5.8 %).

Nowadays it appears that the cherry industry is on the decline: many cherries are being grubbed and very few planted. This tendency, which started before 1940, was not so noticeable during or just after the war; in the last 5 years, however, it has become much more manifest.

In 1947 we started extensive research on the cherry (culture, varieties, outlet, etc.). The results have shown that much can still be done to give the cherry industry a sounder basis so that decline may be turned into progress (3). The same conclusion was reached at a meeting held at the Institute of Horticultural Plant Breeding in 1952. This meeting was attended by persons concerned with the growing, commercialization and processing of cherries and by the staff of the Horticultural Advisory Service (1). It was evident that not only improved cultural measures but especially replanting with better varieties would have a favourable effect on the production costs, prices and yields, thus increasing the productivity of the cherry industry.

These improved varieties should have higher standards than the old varieties of the following qualities:

Picking quality (dependent on the fruit arrangement, and whether a variety is cropping evenly);
Disease resistance (bacterial canker, brown rot, virus diseases, silver leaf);
Susceptibility to poor weather conditions;
Fertility;
Fruit size;
Transport and storage qualities;
Pollination requirements (self-compatible or intercompatible with the leading varieties);
Time of ripening (favourable ripening intervals).

To obtain such varieties a start was made with the study of the most important varieties occurring in the Netherlands. This research has already produced important practical results.

In addition many varieties were collected from the Netherlands and from abroad, as many of them were likely to prove of great value.

Later, a breeding programme was started. The following examples show that good gene material is available:

*a.* Three times as many kg of fruit are picked from Schneiders Späte Knorpelkirsche per time unit as from Früheste der Mark.
*b.* With Pater van Mansfeld up to 100 % of the trees are lost in 10 to 15 years, due to bacterial canker; in Inspecteur Löhnis the loss is mostly nil during the same period.
*c.* The so-called "Harde Kassins Frühe" is very susceptible to rain; in many years it cannot be picked on account of the high percentage of cracked fruits; on average the percentage in Wijnkers is less than one-fifth of that in Kassins.
*d.* The fertility of Morel is three times that of Frühe Französische.

Some of these investigations are being carried out in collaboration with other research workers. Unless stated otherwise, they belong to the staff of the Institute of Horticultural Plant Breeding.

## Regrouping the list of recommended varieties

The first step towards improvement was a study of important commercial varieties grown in Holland. This led to important changes in the list of recommended varieties, and subsequently in the planting of varieties (Table 1), as the majority of the growers act on the recommendations in this list.

So far there have been three categories of recommendation:

*a.* Recommended varieties;
*b.* Additional varieties;
*c.* Promising varieties.

Of nine varieties that had been classified as recommended for many years, two were discarded in the last issue as being no longer of value and seven were placed in a new category of local importance only. Abesse de Mouland (= Bastaarddikke = Eisdense) and Varikse Zwarte were discarded. Early Rivers, Klerk, Pater van Mansfeld

TABLE 1. SURVEY OF THE VARIETIES DESCRIBED IN THE LAST FOUR ISSUES OF THE NETHERLANDS LIST OF FRUIT VARIETIES (1938/39, 1943, 1948, 1954), AND OF THE CLASSES UNDER WHICH THEY HAVE BEEN GROUPED.

| Variety | 1938/1939 | 1943 | 1948 | 1954 |
|---|---|---|---|---|
| Abesse de Mouland (Bastaarddikke, Eisdense) |  |  |  |  |
| Early Rivers |  |  |  |  |
| Klerk |  |  |  |  |
| Pater van Mansfeld (Markies) |  |  |  |  |
| Mierlose Zwarte (Udense Zwarte) |  |  |  |  |
| Udense Spaanse |  |  |  |  |
| Varikse Zwarte |  |  |  |  |
| Meikers |  |  |  |  |
| Morelle |  |  |  |  |
| Dikke Loen (Kernielse) |  |  |  |  |
| Drogans Gelbe Knorpelkirsche |  |  |  |  |
| Elton |  |  |  | |
| Hollander |  |  |  |  |
| Wijnkers |  |  |  |  |
| Zeeuwse Zoete Morel |  |  |  |  |
| Bruine Vleeskers (Zwarte of Bruine Spaanse) |  |  |  |  |
| Kentish (Rode Waalse) |  |  |  |  |
| Knolkers |  |  |  |  |

 = recommended varieties;  = additional varieties;

TABLE 1 (*continued*)

| Variety | 1938/1939 | 1943 | 1948 | 1954 |
|---|---|---|---|---|
| Westerleese Kriek (Cerise de Schaerbeek, Wye Morello) |  |  |  |  |
| Beekse Late |  |  |  |  |
| Schneiders Späte Knorpelkirsche (Hedelfinger Riesenkirsche falso) |  |  |  |  |
| Koningskers |  |  |  |  |
| Molenkers |  |  |  | |
| Inspecteur Löhnis |  |  |  |  |
| Wilhelmina |  |  |  |  |
| Eierkriek |  |  | | |
| Vroege van Werder | |  |  |  |
| Rijkmaker | |  |  |  |
| Früheste der Mark | | |  |  |
| Frühe Französische (Lamotte) | | |  |  |
| Guigne d'Annonay (Vroege van Spithoven) | | |  |  |
| "Kassins Frühe" (Zachte Kassin) | | |  |  |
| Beierlander | | |  |  |
| Asdonkse (No. 501) | | | |  |
| Frans Meylingkers | | | |  |
| Bigarreau Napoléon (Gascogner, Rouaan) | | | |  |

 = promising varieties and  = varieties which are not recommended.

(= Markies), Mierlose Zwarte (= Udense Zwarte), Udense Spaanse, Meikers and Morel were classified as varieties of local importance.

Of the ten additional varieties six were reclassified as not recommended (Drogans Gelbe Knorpelkirsche, Elton, Hollander, Zeeuwse Zoete Morel, Kentish = Rode Waalse, and Knolkers), one as promising (Westerleese Kriek = Cerise de Schaerbeek = Wye Morello), and two as of local importance (Dikke Loen = Kernielse, and Wijnkers). Only Bruine Vleeskers = Zwarte Spaanse = Bruine Spaanse was kept in the category of additional varieties.

Of the eight promising varieties in the old lists (1939, 1943) four were deleted, one was reclassed as an additional variety, and three were placed in the group of varieties of local importance. In 1948 five varieties were newly listed as promising; in 1954 three of them were reclassed as additional varieties, one was reclassed as a variety of local importance, and one was deleted. In 1954 three varieties were newly listed, one as additional, one as promising, and one as of local importance.

The 7th edition (1954) is the first to include local stocks (only of cherry), as the demands made on varieties may differ widely with the locality, owing to the different commercial and growing conditions. Thus in one locality a variety may belong to group  , while in others it should be placed in  or  (see Table 1).

TABLE 2. VARIETIES RECOMMENDED FOR GROWING IN THE NETHERLANDS, ARRANGED IN THE ORDER OF THEIR MATURITY; AS A RULE A HIGH MARK INDICATES A FAVOURABLE DEVELOPMENT OF THE CHARACTER IN QUESTION; s = sufficient, i = insufficient

| Varieties | Time of ripening in days after Früheste der Mark | Fertility | State of health | Taste | Resistance to rain | Resistance to brown rot | Size |
|---|---|---|---|---|---|---|---|
| 1. Früheste der Mark | 0 | 5 | 3 | 1 | 3 | s | 1–2 |
| 2. Frühe Französische | 3 à 7 | 3 | 5 | 3–4 | 4 | s | 2 |
| 3. Guigne d'Annonay | 9 à 12 | 4 | 5 | 2–3 | 4 | s | 2 |
| 4. Asdonkse | 9 à 12 | 4 | 5 | 4 | 4 | s | 2½–3 |
| 5. Early Rivers type Alfheim | 10 à 14 | 4 | 3 | 4 | 4 | s | 3 –3½ |
| 6. Kassins Frühe | 10 à 14 | 4 | 5 | 2–3 | 4 | s | 2½–3 |
| 7. Vroege van Werder | 21 à 24 | 5 | 2 | 3 | 3 | s | 2½–3½ |
| 8. Pater van Mansfeld | 24 à 28 | 5 | 2 | 4–5 | 2 | s | 2½–3½ |
| 9. Dubbele Meikers | 20 à 35 | 5 | 5 | 4–5 | 4 | i | 2 –3 |
| 10. Kernielse | 26 à 30 | 4 | 4 | 3–4 | 3 | s | 3 –3½ |
| 11. Mierlo'se Zwarte | 30 à 33 | 4 | 5 | 3 | 3 | s | 2½–3 |
| 12. Wijnkers | 31 à 35 | 4 | 3 | 4–5 | 5 | s | 2½–3½ |
| 13. Inspecteur Löhnis | 31 à 35 | 5 | 5 | 4–5 | 2 | i | 2½–3½ |
| 14. Schneiders Späte Knorpelkirsche | 33 à 40 | 3 | 5 | 4 | 2 | i | 4½–5 |
| 15. Bigarreau Napoléon | 33 à 40 | 5 | 2 | 3 | 2 | s | 4 –5 |
| 16. Udense Spaanse | 38 à 42 | 4 | 5 | 2–3 | 3 | i | 4 –5 |
| 17. Bruine Vleeskers | 40 à 44 | 5 | 4 | 2–3 | 2 | i | 3 –5 |
| 18. Koningskers | 40 à 44 | 4 | 2 | 3–4 | 2 | s | 4 –5 |
| 19. Frans Meylingkers | 44 à 47 | 4 | 4 | 2–3 | 3 | s | 2½–3 |
| 20. Klerk | 44 à 47 | 3 | 4 | 2 | 3 | s | 1 –1½ |
| 21. Morelle | 45 à 60 | 5 | 5 | sour | 5 | i | 2½–3½ |
| 22. Westerleese Kriek | 45 à 60 | 5 | 5 | sour | 5 | s | 1 |

The list of 1954 (the latest) includes 22 cherry varieties. They are given in Table 2, together with an indication of some of their characters. In the list these characters are described in greater detail and more accurately than in previous editions (in which little could be said of important characters such as fruit size and time of ripening, and of pollen compatibility).

This new list is an important step forward, but further improvement seems possible. Therefore many varieties were collected in the hope of finding some promising varieties among the selections made by other workers; in addition many crosses were made in order to produce selections combining as many valuable characters as possible.

## Collecting varieties from the Netherlands and from abroad

The material collected from the Netherlands includes the commonly grown varieties, with strains of these varieties (mutations?), local varieties and chance seedlings which we encountered in nurseries, orchards and gardens.

A total of about 400 varieties and unnamed selections were imported up to the autumn of 1955. The majority of these came from Belgium, Germany, England, France and the U.S.A.; a good many also from Canada, Denmark, Sweden and Switzerland. The new selections and varieties released yearly by experiment stations and breeders are being collected as soon as possible in order to test them under Dutch conditions.

In order to restrict the number of older varieties, introductions were only made from countries where the climate is similar to that of the Netherlands. Varieties which performed well in their country of origin, as well as less satisfactory varieties were introduced; the climatic conditions and growing and commercial requirements in many countries often differ so widely from those in the Netherlands that a variety which is considered unsuitable or has passed out of cultivation elsewhere may prove valuable here. Besides it is often very difficult to assess the value of foreign varieties owing to incomplete descriptions and lack of useful data on their times of ripening.

## Morphological investigations and type selection

Many of the collected varieties have been flowering for some years and have fruited at least once, so that many morphological observations could be made. From these it was shown that the cherry nomenclature is very confused. Many varieties received under the same name were far from being identical (for instance Hedelfinger Riesenkirsche), while other varieties carrying different names proved to be identical (for instance Bigarreau de Jaboulay was encountered under the following names: Lyons, Bigarreau de Lyon, Vroege Bigarreau, A 17, A 46, Vroege van Gelmen, Ramon Oliva and Olivar).

This morphological research is being carried out by Mr. E. T. Nannenga. Within a few years a detailed survey of synonymy (including morphological descriptions) may be expected.

It was found to be necessary to include the varieties occurring in the Netherlands in the morphological investigations, as research on the cultural value and pollination of varieties is not possible if the varieties cannot be recognized. It has often happened

FIG. 1. RIPE MAY DUKE AND GREEN VOLGERS ON THE SAME BRANCH

that a certain variety that did well in one locality gave poor results in another; further research then revealed that the name was the only thing these varieties had in common! With many varieties the local or commonly used names could be replaced by names correct according to nomenclature.

It is not always possible to make a clear morphological distinction between the varieties, notwithstanding the fact that they show clear physiological differences which may be of great practical value, such as differences in disease susceptibility, fruit size or time of ripening. In many cases these differences may be incidental (due to certain circumstances, for instance type of soil, rootstock used) or they may be reproducible (mutations, or varieties resembling each other very closely but originating from hybridization). This can only be found out by means of prolonged and expensive trials in which the types must be grafted on rootstocks which have been propagated vegetatively, and be planted in a number of replications. In general this expensive research has been avoided, and a cheaper solution chosen instead: the Netherlands General Inspection Service for Arboriculture (N.A.K.-B) certifies as mother trees for the supply of scionwood to nurserymen only those trees which belong to the apparently best type. Consequently only trees of that type are planted, and nothing is lost if the differences prove to have been incidental.

"Types" that are difficult to distinguish occur in the following varieties: Früheste der Mark, Frühe Französische, Early Rivers, Kernielse, Mierlose Zwarte, Meikers (= May Duke = Anglaise hâtive = Rote Maikirsche), Varikse Zwarte, Wijnkers, Bigarreau Napoléon, Abesse de Mouland, and others.

With one of these varieties, namely May Duke, the above "solution" is only effective to a limited extent. This is because of some kind of instability of the fruits, so that on one tree numerous variations in fruit shape and ripening may be encountered. The practical growers speak of May Dukes (which are further divided as early, midseason and late types, viz. Moortjes, May Dukes and Boskopers) and Volgers. The latter grow on the same trees as the May Duke but mature up to 3 weeks later and also differ from them in shape, size, taste, and shape of the stone. Closer observations have shown that with respect to maturity and fruit shape various intermediate forms are encountered on one and the same tree; in addition, the extent to which Volgers are produced varies from year to year. Consequently if a certain good type should be selected, the same phenomena would again appear to a greater or less extent. The question now is whether constant types can be found; this depends on the cause of the phenomenon. If the variations are caused by a virus disease, as some people think, it should be possible to find such types. Another supposition is that the May Duke is a chimaera. Extensive research into this question is being carried out.

As soon as this point has been clarified selection as requested by the practical growers may be possible. Then the growers would have to be supplied with varieties which ripen evenly, and follow each other in picking time. In addition such varieties should possess the good quality of the May Dukes and Volgers.

## Breeding techniques

The first series of crosses were all carried out by hand, at first in the orchards of growers, but later this was done in our own trial fields. If flowering was not uniform, some pollen was stored or branches of the later flowerer were forced to bloom. Pollen was not stored until the next season. Crosses that proved incompatible were discarded.

The best pollination technique was as follows: Remove (not more than 4 days before the opening of the flowers) the calyx, corolla and stamens by tearing the calyx off all round at the broadest spot (this is done with a pair of forceps); pollinate immediately or during the 5 subsequent days (when the stigma is sufficiently sticky) taking special care to dust each stigma with a sufficient amount of pollen; pollination is readily done with a flower from which the style and petals have been removed; if much pollen is available, it may be advisable to collect it and to pollinate with a fine brush; bagging is not necessary, provided the branches of "stripped" flowers cannot be blown against other branches.

In spite of the elimination of incompatible crosses and the development of an effective and rapid pollination technique, the labour requirement in relation to the numbers of seedlings obtained remained very high. Apart from the weather conditions which may occasionally play a part, this is mainly due to the fact that not more than one seed can be harvested per pollinated flower, and that in a number of seedlings many of the embryos abort in the seeds.

Therefore, for crosses that can be carried out for a number of consecutive years, and for others of which appreciable numbers of seedlings are wanted, trees have been grown on in pots. Before the opening of the flowers these trees are placed in pairs in insectproof isolation cages in which pollination is carried out by "clean" bees. This is only possible for the sweet cherry, as it is entirely self-incompatible; in the other cases

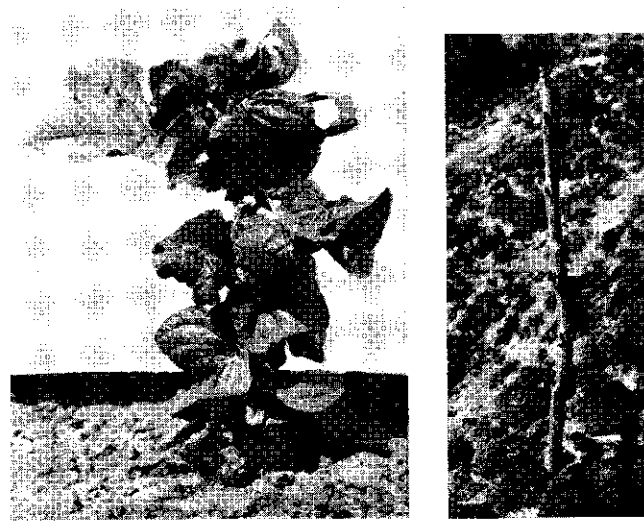


FIG. 2
ABNORMAL GROWTH OF A PLANT GROWN UP WITH THE AID OF EMBRYO-CULTURE (LEFT); NO TERMINAL BUD OCCURS BUT THERE ARE LATERAL BUDS AS APPEARS FROM THE PHOTOGRAPH RIGHT

the calyx has to be removed so that the amount of labour saved is less. There are other advantages, however, as for instance a greatly reduced dependence on the weather conditions and simpler control of flowering. In addition it may be possible to eliminate pollen incompatibility under such controlled conditions. Research in this direction is carried out by Mr. KOH YAM OH.

Incompatibility may also be eliminated by the method of LEWIS (10) in which X-ray treatment is given to the flower buds. If important combinations should really prove to be incompatible, even at lower temperatures or when applying growth substances or other methods, it would certainly be worth while trying this treatment.

In many cases the germination percentage of the seeds is low, even when properly stored and after-ripened (for at least 3 months at a temperature of 5 °C or less). To obtain a greater number of seedlings, embryo culture has been used; methods and results will be discussed in detail in a later paper (2) by the present writer together with Mr. J. P. BRAAK.

When plants have been grown by means of embryo culture, it often appears to be difficult to keep them growing, or to re-start growth; some phenomena of abnormal growth also appear. Therefore Mr. L. SMEETS has carried out research on the possibilities of influencing growth and abnormal phenomena by controlling day length or temperature or both, for it is of the utmost importance to keep as many of the plants alive as possible, and to make them develop as soon as possible into healthy, fruiting plants. In addition it may be possible to shorten the "juvenile phase" of the seedlings so that the plants come into bearing earlier (12).

Dukes are hybrids of *Prunus cerasus* and *P. avium*; they are tetraploid. *P. cerasus* is also tetraploid, but *P. avium* is diploid. In order to make new Dukes, material of *P. avium* is being made tetraploid by Mr. A. E. ZEILINGA. Colchicine treatment of seed would be the simplest way. But treatment of good cultivated varieties of *P. avium* is preferred, as they nearly always have greater cultural value than seedlings and are expected to flower earlier, because the original material was ripe for flowering.

This will also enable us to study the influence of chromosome doubling on self-incompatibility and yield of *P. avium* varieties. Yield is now often too low, owing to insufficient cross-pollination; in the case of full self-compatibility this will no longer play a part, and block planting will be possible (10).

Crosses between other *Prunus* species are also being explored. This is done in co-operation with Dr. R. PRAKKEN, professor of genetics in the Agricultural University of Wageningen.

The production of gene mutants (5, 10) has not yet been tried, but crossings with pollen of a variety with a mutated S-gene, obtained from Dr. LEWIS (9), have already been made.

## EVALUATION OF UNKNOWN VARIETIES AND NEWLY PRODUCED SEEDLINGS

The seedlings obtained by hybridization and the unknown varieties collected from the Netherlands and from abroad are being selected according to the scheme for pome and stone fruits used at the Institute of Horticultural Plant Breeding. This scheme comprises the following consecutive phases:

*Nursery* (2 years). The young seedlings and grafted trees are planted closely together. Diseased and very weak plants are discarded; in seedlings of important crosses from which only very few viable seeds are obtained, this selection is less rigorous than in the other seedlings. After 2 years the plants are transferred to selection field A.

*Selection field A.* (max. 10 years). The planting distance depends on vigour and precocity. So far the following spacings have been used:

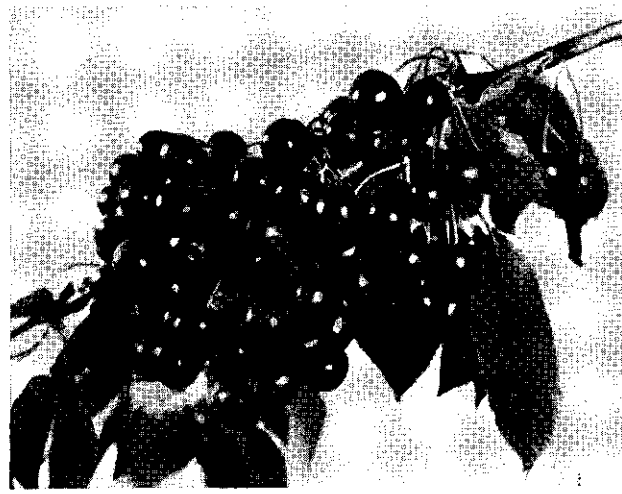
3 × 5 m for seedlings of sweet cherries
3 × 4 m for seedlings with "sour blood"
2 × 3 m for varieties.

During the first fruiting years the seedlings do not produce normal fruits (6). Not until they have borne fruit for a number of years can it be ascertained whether they are really better than the established varieties of identical maturity. As the collected varieties are ripe for flowering they are considered to flower earlier, produce normal fruits earlier, and to be ready for inspection sooner than the seedlings. Hence their closer spacing. In order to reduce the risk of delay which may occur if the trees become diseased or die, 2 trees of each variety are planted. The seedlings with "sour blood" are planted more closely than the sweet cherries, as May Duke and Morel are weaker growing than the sweet varieties, and seedlings with one of these varieties as a parent come earlier into bearing.

In selection field A special attention is paid to the following characters: time of ripening, colour, fruit size, stone size, taste, and resistance to bad weather conditions before and during maturity. Unfruitful or diseased specimens and those which produce very small fruits or have a poor taste may, even in the seedlings, be removed before the normal fruits are produced. Promising seedlings or varieties that may prove valuable as parents are maintained.

*Selection field B* is destined for promising seedlings and varieties from selection field A; also for foreign and local varieties which are known to have many favourable characters. For comparison a number of good standard varieties are also included.

FIG. 3. EXTREME FERTILITY OF A SEEDLING



In this selection field 6 trees of each variety are planted in a block. Two of them are permanent trees and spaced at 10 × 8 m; the rootstock for these permanent trees is F 12/1, an English selection from the *Prunus avium*, which is said to be very resistant to bacterial canker, is vigorous and bears fairly early. Between the permanent trees are the filler trees, 2 on seedlings Limburgse boskriek (wild *Pr. avium*= *Mazzard*) and 2 on seedlings of *Pr. Mahaleb* so that their compatibility with these rootstocks may also be studied. The poor varieties in selection field B are gradually discarded and the good ones are eventually included in variety trials.

In selection field B special attention is paid to characters of hardiness, succulence, juice colour, disease resistance, transport and storage quality, growth habit, precocity, degree of fertility, picking quality and pollination requirements.

*Variety trials.* The varieties which behave favourably in selection field B are included in commercial trials and, if possible, in variety trials carried out throughout the country (systematic variety trials).

In commercial trials promising varieties from selection field B are distributed among growers in various parts of the country and on various soil types.

To obtain a good impression of the varieties as soon as possible both phases may begin simultaneously.

## TRIALS OF COLLECTED VARIETIES

The collected varieties have not yet been sufficiently studied to say which of them are most suitable for planting. However, some 100 varieties which, according to the literature or some Dutch growers, look promising, have been planted in selection field B. F 12/1 was planted ungrafted, and in 1954 the varieties were grafted on the crown; because the framework branches are formed by F 12/1, loss of trees due to bacterial canker is less likely to occur.

It appeared to be difficult to graft upon the rootstock *Prunus Mahaleb*, and to grow a trunk of it, as was desired. Besides, rooting was very unsatisfactory on heavy

clay. However, from this experiment it was evident that fertility was induced earlier in grafts on *Prunus Mahaleb* than in those on the *P. avium* seedling. Flowering occurred as early as 1953 and the first fruits were harvested in 1954.

A number of varieties have already been included in variety trials and small-scale commercial trials.

### Production of Prunus avium seedlings

Thousands of crosses between *P. avium* varieties during the years 1950–1954 resulted in 306 seedlings, some of them growing in selection field A, others still being in the nursery. In addition 1202 seedlings of free-pollinated *P. avium* varieties were produced. Some of the seedlings of the 1950 crosses flowered in 1954; in 1955 nearly all of them flowered and the first fruits were picked.

As has already been stated, a great many flowers may have to be pollinated to obtain a few plants. The following examples illustrate the minimum and maximum yields obtained. From 514 flowers of Schneider, pollinated with Early Rivers, 19 seeds but only 1 plant were obtained! On the other hand 398 flowers of Early Rivers pollinated with Wijnkers produced 161 seeds and 46 plants.

From Table 2 it can be seen that in the first place good varieties are needed which ripen a) before Asdonkse; b) between Early Rivers and May Duke, Loen or Mierlose Zwarte; c) after Schneiders Späte Knorpelkirsche. Therefore the following crosses are for the present considered the most important:

Gendtse × Frühe Französische
Asdonkse × Pater van Mansfeld
„ × Inspecteur Löhnis
„ × Schneiders Späte Knorpelkirsche
Kassins Frühe (soft type) × Pater van Mansfeld
„ „ „ × Inspecteur Löhnis
„ „ „ × Schneiders Späte Knorpelkirsche
Early Rivers × Inspecteur Löhnis
„ „ × Schneiders Späte Knorpelkirsche
Kassins Frühe (firm type) × Wijnkers
Wijnkers × Inspecteur Löhnis
„ × Schneiders Späte Knorpelkirsche
Schneiders Späte Knorpelkirsche × Koningskers
„ „ „ × Grevense

The choice of these varieties as parents has been primarily dependent on their yield, health, taste, resistance to rain and brown rot, and fruit size.

### Production of better Duke varieties

So far May Duke has been about the only representative of the Duke varieties in the Netherlands. In 1946 over 40 % of all the cherries grown in the Netherlands, and 80 % of those grown in the "Betuwe" (the main cherry area of the Netherlands) were May

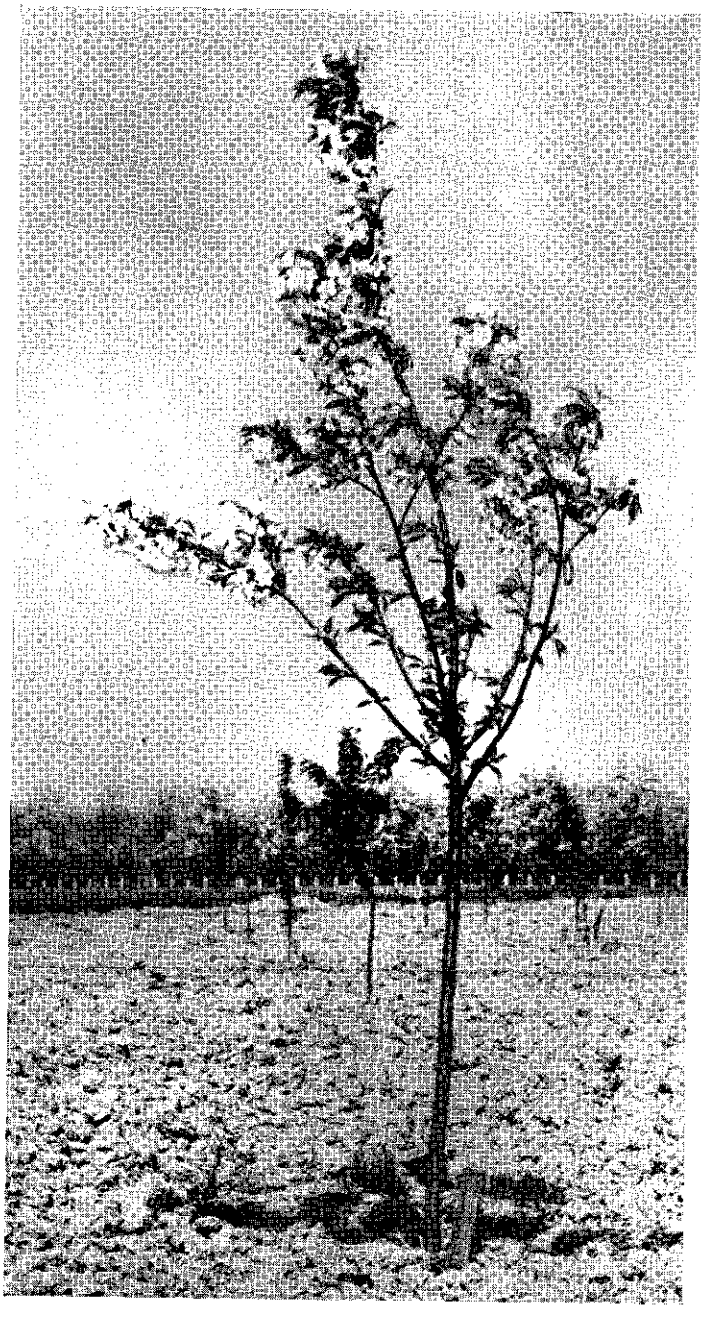


FIG. 4. PROLIFIC BLOOM IN THE 3RD YEAR OF A SEEDLING FROM THE CROSS SOUR × SWEET (PR. CERASUS, VAR. MOREL × PR. AVIUM, VAR. WIJNKERS)

Duke. Indeed, this variety has some very good characters which are partly lacking in the sweet cherries. Its taste is very nice, and it makes a fairly good "filler" tree because of its pyramidal growth and early fruiting. However, its very irregular ripening means several pickings, which increase production costs. In addition the soft texture of the fruits and the occurrence of off-types account for the fact that the May Duke acreage is rapidly diminishing and that only a few May Duke trees are now being planted. Therefore improvement of this variety is very desirable.

To this end the selection of good types of May Duke and the production of seedlings of selfed May Duke trees is being undertaken; in addition crosses of May Duke × Morello, and of May Duke × *P. avium* varieties are being made. As May Duke is self-compatible, selfing produces good results. The easiest way is to harvest stones of free-pollinated trees in the centre of pure May Duke orchards.

Just like May Duke, Morel is tetraploid. But the latter is a variety of *P. cerasus*, the sour cherry. This variety is being more widely grown for processing. The tree is relatively small, bears well and early, and its fruits are large. This is a great merit, although the fruits are not suitable for fresh consumption because of their high acid content.

The *P. avium* varieties are diploid. In exceptional cases crossing with May Duke may result in a tetraploid hybrid (7, 11). In the majority of cases, however, the hybrids are triploid. Therefore, in addition to direct crosses between May Duke and *P. avium* varieties, crosses of May Duke and tetraploidized *P. avium* varieties are being made. Some foreign tetraploid varieties of *P. avium* have also been used as parents. Other Dukes have not yet been used in crossing, as they are generally considered less suitable as parents.

During the years 1949–1953 some thousands of crosses have produced 276 seedlings which are now growing in selection field A. In addition there are 282 seedlings of selfed May Duke, 11 seedlings of selfed Morel and 85 seedlings of Limburgse Boskriek, a wild growing *Prunus avium* used as a rootstock for cherries. The latter seedlings were selected in a nursery as they were not quite sweet; probably some of the flowers of the mother had been pollinated by bees carrying pollen of wild sour cherries ( all appear to be triploid).

Flowering occurred as early as 1953; in 1954 out of 546 trees planted the year before, 382 flowered, the majority abundantly. In most combinations, however, the number of fruits produced was very small and those that were produced dropped prematurely and had no embryos. Fruits only set satisfactorily in the cross Morel × May Duke and reciprocally.

Further experiments on a number of floriferous but non-bearing seedlings showed them to be triploid, as was to be expected (1).

Seedlings derived from the cross May Duke × Morel should, theoretically, be tetraploid; their fertility proves that this is so. From the first series of observations it was shown that the majority of the fruits are sourer than May Duke, in fact too sour for fresh consumption; time will show whether there are types among these seedlings that can be used either immediately or as parents.

The seedlings of free-pollinated May Duke and Volger generally grow poorly and show many leaf distortions, especially those of Volger. The trees started to flower in 1954 but fruits have not yet been produced.

Morphologically, it is of interest to note that the growth habit, vigour, shape of leaf and flower, leaf size and inflorescence in many cases are intermediate between those of the parents but occasionally strongly resemble one of the parents (seldom, however, in all characteristics). Types that are entirely sweet, particularly from the viewpoint of growth habit, do not occur. But there are some types that closely resemble Morel or other sour cherries. May Duke and Volger seedlings all closely resemble their parents.

## Summary

1. The area of cherry culture is decreasing in the Netherlands but improvement of the varieties would probably make cherry growing more profitable and more popular again.
2. Many varieties have been collected from the Netherlands and from abroad. Morphological, physiological and cytological investigations were initiated.
3. A first step towards improvement was made by studying the varieties already available in the Netherlands, type selection, and regrouping the list of recommended varieties.
4. Further improvement is expected from studying the imported varieties and from breeding work, which has been started.

## Samenvatting

### *Kersenveredeling in Nederland*

De kers is een vrij belangrijk fruitgewas in Nederland; de teelt van kersen is echter sterk aan het achteruitgaan. Bij onderzoek naar de oorzaken hiervan is gebleken, dat er nog veel mogelijkheden zijn om de kersenteelt rendabeler te maken, o.a. door verbetering van het rassensortiment; besproken wordt, welke eigenschappen een verbetering kunnen ondergaan.

De eerste schrede in deze richting was een bestudering van het Nederlandse sortiment, met als gevolg hiervan grote wijzigingen in de Rassenlijst (tabel 1).

Vele (ongeveer 400) rassen, uit diverse landen afkomstig, werden bovendien verzameld ter nadere bestudering.

Het vaak zeer geringe verschil tussen de rassen heeft een grote naamsverwarring tengevolge gehad; een uitgebreid onderzoek wordt daarom uitgevoerd door Drs. Nannenga.

In de Meikers komen zeer veel typen voor, evenals onder de Volgers; deze typen zijn niet constant, en gaan vaak in elkander over. Een en ander is voor de teler soms zeer schadelijk. Onderzoek naar de oorzaak hiervan, en over de mogelijkheid de typen te scheiden en constant te houden, is gaande.

De aantallen na kruising verkregen zaailingen waren betrekkelijk gering in verhouding tot de verrichte arbeid, ook na het ontwikkelen van een efficiënte bestuivingstechniek. Om de arbeidshoeveelheid te verminderen, werden van de kruisingsouders planten in potten opgekweekt; deze worden tijdens hun bloei in insectendichte ruimten gebracht, waar bijen de bestuiving uitvoeren (hetgeen zonder castreren mogelijk is door de zelfsteriliteit van de zoete kersen). Ir. Koh Yam Oh verricht bovendien onder-

zoek naar de mogelijkheid van opheffing of vermindering van de incompatibiliteit tussen te kruisen rassen.

Om ook planten te verkrijgen uit de zaden met een minder goed ontwikkeld embryo, werd tezamen met Drs. BRAAK embryocultuuronderzoek gedaan. Daar het opkweken van de m.b.v. embryocultuur verkregen planten soms moeilijkheden gaf, deed Ir. SMEETS onderzoek naar de invloed van daglengte en temperatuur; tevens dient dit onderzoek om na te gaan of en in hoeverre het tijdstip van het intreden van de vruchtbaarheid vervroegd kan worden.

Voor het kruisingswerk ter verkrijging van betere Meikersen is het van groot belang over tetraploid gemaakte rassen van zoete kersen te beschikken; deze rassen hebben misschien ook nog andere voordelen, zoals b.v. zelffertiliteit. De heer ZEILINGA voert het werk ter verkrijging van tetraploide rassen uit.

Kruisingen tussen verschillende Prunussoorten (kers, pruim, perzik, enz.) worden verricht in samenwerking met Dr. PRAKKEN, Hoogleraar in de Erfelijkheidsleer aan de Landbouwhogeschool.

De verzamelde rassen en door kruising verkregen zaailingen worden geselecteerd op z.g. selectievelden. De selectie-eisen en de toegepaste methodiek worden besproken, en de kruisingsouders genoemd.

De beproevenswaardige rassen worden in rassenproefvelden en praktijkproeven nader op hun waarde voor de praktijk onderzocht. Met veelbelovende zaailingen zal dit ook gebeuren. Een groot aantal zaailingen staat reeds op de selectievelden, en een gedeelte hiervan droeg reeds vrucht.

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