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НОВЫЕ МЕТОДЫ И РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЙ ЛАНДШАФТОВ В ЕВРОПЕ, ЦЕНТРАЛЬНОЙ АЗИИ И СИБИРИ

Монография в 5 томах

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Chapter I/95: COMPOSITION AND CONSERVATION OF THE FRUIT TREE VARIETY ORCHARD IN MÜNCHEBERG, GERMANY

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ABSTRACT. We report on research and preservation of the fruit tree variety orchard at the site in Müncheberg, Germany. Today's variety collection with about 1,000 varieties on about 4,000 individual trees builds on the collection of the Kaiser Wilhelm Institute Müncheberg founded in 1928. The collection contains about 1,500 genetic patterns of fruit species in Germany, Eastern Europe and America. This gene pool is an indispensable part of future breeding work. The preservation of the varieties has a cultural-historical aspect as well and has significance for the future design of agricultural landscapes in Northeastern Germany.

Резюме. Сообщается об изучении и сохранении сортов плодовых культур в саду в Мюнхберге, Германия. Сегодня коллекция насчитывает около 1000 сортов в виде 4000 отдельных деревьев и базируется на коллекции Института Кайзера Вильгельма в Мюнхберге, основанной в 1928 году. Коллекция содержит около 1500 генетических моделей фруктовых видов в Германии, Восточной Европе и Америке. Этот генофонд является неотъемлемой частью будущей селекционной работы. Сохранение сортов также имеет культурно-исторический аспект и имеет значение для будущего проектирования сельскохозяйственных ландшафтов в северо-восточной Германии.

KEYWORDS: Fruit species, variety orchard, Müncheberg, gene pool, agricultural landscape

INTRODUCTION: FRUIT GENETIC RESOURCES AND BIODIVERSITY

The genetic resources are the past, the present and the future of every agricultural sector. They form the basis for adaptation of breeds to climate changes, the potential for resistance to new pathogens or changing market requirements. In fruit tree growing there are wide possibilities of use. Fruit trees can be grown in various forms of land use, in the landscape-characterizing extensive cultivation (non-commercial orchard growing and fruit tree planting along roads and dirt ways) or in the settler, house and allotments gardens as well as in the trellises of the art gardens.

The genetic variability of the varieties and the combination options with rootstocks of various vigor enable a nearly unlimited development of different forms of use.

The gene pool identified by the currently officially approved and traded varieties is completely impoverished. The apple breeding of the past 100 years has severely limited the genetic basis of today's marketable apple varieties. All modern varieties come more or less from only three ancestor varieties ('Golden Delicious', 'Cox Orange' and 'Jonathan'). This genetic restriction led to susceptibility to fungal diseases and pests. The robustness of old varieties should be combined with the potentials of modern apple varieties in breeding [1].

The preservation of the gene pool of wild and cultivated plants is subject to the Convention on Biological Diversity [CBD, 2]. It is valid for (a) all fruit species in Central Europe, whether or not in use, whether of potential importance or not, (b) the diversity within and between the fruit species, such as varieties, land forms, wild species and hybrids, (c) the corresponding ecosystems, e.g. at the natural site (in situ) or in gene pools or collections (ex situ), and for various uses such as e.g. scattered fruit trees and plantation fruit trees [3]. For this purpose, a decentralized gene bank was set up in Germany, comprising five networks (apple, cherry, strawberry, plum and rubus species) with 28 collections and 17 collection-holding partners [3,4].

The current practice of implementing the CBD in Germany can not prevent the extinction of old varieties of fruit.
FRUIT GROWING IN THE EAST OF GERMANY

Fruit growing has a tradition in eastern Germany. Fruit was not only grown in gardens, but mainly along dirt roads, roads and other elements of the landscape. Fruit trees were an integral part of the structural diversity of the agricultural landscape (Fig. 1, 2). At the beginning and into the half of the 20th century, the structural diversity of agricultural landscapes reached an optimum [5]. Landscape structure and biodiversity are closely related. The fruit blossom in April / May was the beginning and first highlight of the beekeeper season. Subsequently, the other crops of agriculture, horticulture and forestry benefited from the pollination activities of bees and numerous wild insects [6].

FRUIT RESEARCH AT THE LOCATION MÜNCHENBERG

Müncheberg is located 55 km east of Berlin. The location is characterized by a comparatively rough and clearly continental climate as compared with average German conditions. Only the months of July and August are 100% frost-free.

Founded in 1928 on the initiative of the plant geneticist Erwin Baur, the Kaiser Wilhelm Institute for Plant Breeding Research in Müncheberg fulfilled its mission of cultivating particularly frost-resistant varieties of fruit, including grapes [7,8]. The apple varieties 'Alkmene', 'Auralia', 'Carola', 'Elektra', 'Herma', Erwin Baur', 'Olivia', and 'Undine', the plum varieties 'Julipflaume', 'Certina', 'Fertilia', 'Anatolia', and the strawberries 'Müncheberger Frühe', 'Müncheberger Frühernte', and 'Brandenburg' are particularly successful breeds from Müncheberg.

In Müncheberg breeding research was carried out after WW II up to 1989 for the fruit species apple and cherry, for which several hundred to a thousand plant crossings were carried out each year. In addition, the performance tests for the various types of fruit and for rootstocks were carried out here [7].

THE MÜNCHENBERG ORCHARD OF FRUIT TREE VARIETIES (Fig. 3)

The structure of the collection is based on a centuries-old horticultural tradition of today's state of Brandenburg and the preservation of traditional cultivation methods in rural areas. The preservation of the varieties meets a regional cultural-historical aspect.

On a national scale, the need to create and maintain decentralized gene libraries is paramount. They serve as backup copies of phytosanitary emergency cases in the central collection (fire blight, apple addiction or vein yellowing) and should be located in other climatic zones than the central collection due to the different levels of pest infestation.

In case of the fruit species apple and pear, the variety orchard represents a collection of historical cultivars and forms. It is an image of the fruit varieties planted in the area of the former German Empire during the past 250 years and preserved in the Eastern Federal States of Germany. The current variety collection with about 1,500 genetic patterns (about 1,000 varieties on about 4,000 individual trees) builds on the collection of the former Kaiser Wilhelm Institute Müncheberg [10]. In addition to the European varieties, the best varieties of the North American continent and the world assortment were included, some of which were already distributed in the 1920s by the nursery Späth, Berlin. Examples are 'Baldwin', 'Yellow Bellefleur' and 'Orleans'. An ongoing update of the variety garden in Müncheberg was made by H. MURAWSKI [11]. American varieties with resistance to the apple scab found their way into the collection, according to the clones of SHAY and HOUGH (WEBERS, 2016, [12]).

THE WORK OF THE PAST 25 YEARS

An extension of the variety stock was made in the 1980s by the Department of Breeding of the Institute for Fruit Research Dresden-Pillnitz, to which the station Müncheberg belonged from 1973-1989. Several Russian, Asian and other varieties of the world assortment with good resistance properties found their way into the collection during this period.

At the beginning of the 1990s, the entry of locally distributed varieties of the eastern and partly western Federal States of Germany, such as Sohland a. R. (W. HAIN), Wrzen (H. PETZOLD), Jena (W. SCHURICHT), Stollberg / Gablenz (H.KEMPF), Frankfurt / Oder (H. GRIESBACH), Magdeburg (M.BLAU), Magdeburg, Reisermuttergarten (S. SCHÖSSIG), Dessau / Bad Pyrmont (F. BERGT) and Meckenheim (G. HERR). The regional cultivation value of these varieties was given by decades of long-term observation work done by the mentioned experts.

Also at this time a part of the collection of local varieties, which were removed in the 1950s from the variety garden, from a security planting in the Rotes Luch, near Müncheberg, returned to the variety garden. Here it was varieties such as 'Sweet Delicious', 'Orleans', 'Wagnerapfel' but also 'Grand Richard' and 'Mauthausener Limonenrenette'.

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In the years from 1994 to 1998, in a project funded by the Federal Ministry of Agriculture (BML) and the State of Brandenburg, a random survey of the variety structure of approx. 18,000 high-stemmed fruit trees with a life span of more than 50 years took place in five counties. The oldest initial plantings of apple and pear fruit, which have survived to this day in Brandenburg, date back to plantings in the middle to late
18th and early 19th century. The varieties from the oldest apple avenue, plantation around 1804, were completely preserved by grafting and budding. In addition to this survey, from 1986 to 2015 more than 35,000 variety samples were determined from all parts of Brandenburg and neighboring Federal States. The pomological evaluation of the fruit samples led to an entry of numerous, unknown varieties or regional secondary forms of the main varieties (samples) into the variety garden.

UNDERSTOCKS FROM THE 18th AND 19th CENTURY
A last group of woody fruit plants, which has not been considered in any European collection, are the understocks (rootstocks) of the late 18th and early 19th century. From the regeneration of up to more than 200 years old *Malus* understocks original material was secured, which dates back to the time of the small ice age, i.e. before 1850. In contrast to the collections of cultivated varieties, forms of the wood apple are included.

Local fruit has been an integral part of the diet of the rural population for the past 200 years. Today supposedly inferior varieties were developed by special processing variants. The variety of varieties in maturity, storage suitability, fruit shapes, color and size as well as the internal quality of fruit formed the basis for the preservation of the varieties over long periods of time. The resistance of the trees to weathering and harmful organisms was the basis for the long survival of the varieties. The trees were able to build long-lasting, strongly growing crowns. Striking examples are 'Rotgestreifte Gelbe Schafsnase', 'Borsdorfer Renette' or 'Lothringer Rambour', but also 'Riesenboiken', 'Deutscher Grüning' and 'Grüner Winterstettiner'.

CONCLUSIONS
1. The Müncheberg variety orchard contains unique varieties and rootstocks of fruit trees from Germany, Europe and North America.
2. The orchard represents a significant landscape and cultural heritage.
3. The preservation of this orchard should be an indispensable part of future research about the design of agricultural landscapes.
Attachment: Photos of the variety orchard Müncheberg

Photos – Apple breeds of the Müncheberg variety orchard: 'Roter Herbstkalvill', 'Signe Tillisch', 'Ostpreussischer Kurzstiel', 'Grüner Fürstenapfel', 'Fromms Renette',

Photo – Public field day in the variety orchard Müncheberg

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Глава I/96: УСТОЙЧИВОСТЬ СОРТОВ ЯБЛОНИ К АБИОТИЧЕСКИМ СТРЕССОРАМ В АГРОЛАНДШАФТЕ КРАСНОДАРСКОГО КРАЯ

Chapter I/96: Stability of Apple Varieties against Abiotic Stressors in the Agrolandscape of the Krasnodar Region

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РЕЗЮМЕ. Приведены результаты физиолого-биохимических исследований устойчивости сортов яблони к абияотическим стресс-факторам. На ландшафтной основе у сортов яблони отечественной селекции выявлены высокие потенциальные адаптационные возможности в условиях экстремальных воздействий среды, что позволяет использовать их в селекционном процессе как источники признаков зимостойкости и засухоустойчивости. Установлено, что адаптация сортов яблони отечественной селекции к абияотическим факторам зимнего периода достигается увеличением содержания связанной формы воды, пролина, сахарозы, выполняющих протекторную функцию, фенолкарбоновых, абсцисовой кислот, увеличения активности пероксидазы. Выявлено, что резервы адаптационной устойчивости сортов яблони к стрессорам летнего вегетационного периода обусловлены повышенным содержанием связанной формы воды, пролина, сахарозы, хлорофилла, каротиноидов, аскорбиновой, фенолкарбоновой, абсцисовой, индолилуксусной кислот.