

THE RELATIONSHIP BETWEEN SELECTED, CLIMATIC CONDITIONS IN 1959-2003 YEARS AND THE POSSIBILITY OF PEACH CULTIVATION IN THE LOWER SILESIA REGION

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ABSTRACT

The major factor limiting the cultivation of peach is minimal temperature in the winter and spring frosts. In the winter flower buds of peach are frozen in -20°C temperature, and in the spring buds are destroyed by spring frosts from -2 to -4°C temperature. From 1989 to 2003, the weather course favored the yielding of different cultivars of peach in the conditions of Lower Silesia –the southwestern region of Poland. From the last 15 years, the higher average, monthly temperature for December-March and fewer frost days were noted for this region. In years 1989-2003, three seasons were danger for peach tree. In spring of 1990 and 1991 were strong frosts and in 1996, temperature $-21,6^{\circ}\text{C}$ was noted in February. Depend on the weather conditions and cultivar of peach, the obtained yield oscillated from 5 to 52 kg per tree. The record yield – 48 ton per ha, was noted from ‘Inka’ cv. trees in 2003 year. The obtained results showed the favor climatic conditions for peach cultivation in the Lower Silesia region. The risk of this cultivation can be limited by planting cultivars resistant from frost and using sprinkling irrigation to protect the trees from spring frosts.

KEY WORDS: minimal temperature, frost, peach, yield

INTRODUCTION

The peach is a very attractive fruit for customers, due to high savory and dietetic value as well as high worth for different fruit products. In 2000 in the world was picked 13.757 thousand tons fruit of peach. The highest producers of peach are: China (30%), Italy (12,6%) and USA (10,3%). Poland produces 8-10 thousand tons of peach. Home products provide 10% general consumption of peach - 2,5 kg per one person [Kubiak 2001].

The small production of peach in Poland results from lack of optimal climatic conditions for cultivation of this species. Peach can grow in region with average yearly temperature $+8^{\circ}\text{C}$ and with the sum of active temperatures 2500°C , during the vegetative season. The principal factor which limits the cultivation of peach is minimal temperature in the winter and spring frosts. In the winter, stem of tree, its branches and shoots are destroyed in -25°C , flower buds of peach are frozen in -20°C temperature [Hołubowicz 1986]. In the spring, 10-90% flower buds are destroyed by spring frosts from -2 to -4°C temperature [Treder 2001]. Therefore the peach orchards are planted above all in the west and southwestern part of Poland. However, in the last decade new orchards of peach were

located as well as in the south and center of Poland. This is a result of better climatic conditions and cultivation of cultivars resistant from frost.

The aim of this study is estimation of possibility of peach yielding from point of view of changing weather conditions.

MATERIAL AND METHODS

The research was carried out in the Experimental Station in Samotór. This Station belong to the Department of Horticulture at Agricultural University of Wrocław. The Station is located 3 km from the border of Wrocław, in the northwestern of the city, on the height 131 m of sea level.

This region is called Lowland of Lower Silesia and characterizes the following climatic conditions: average yearly temperature: $+8,3^{\circ}\text{C}$, the coolest month - January with average monthly temperature: $-1,4^{\circ}\text{C}$, the warmest month - July with average monthly temperature: $+17,6^{\circ}\text{C}$, average length of vegetative season: 220-227 days, average sum of rainfall: 592 mm, date of the first autumn frost: 22.X., date of the last spring frost: 18.IV.

From the beginning of establishing of the Experimental Station, the temperatures: maximum, minimal, daily and monthly were noted. The collected data from Samotwór Station and Meteorological Station Wrocław-Strachowice allowed for the estimation of weather course during the winter and the risk of frost days with -2°C in the period from the 1st April till 12nd May in 1959-2003 years.

The yielding of peach trees was estimated on the base a few experiments with different cultivars of peach trees. In the spring of 1988 year 'Reliance' and 'Redhaven' cultivars of peach trees were planted on *Prunus mahaleb* var. *divaricata* rootstock, in spacing 4 x 4 m. In the spring of 1996, peach trees of 'Inka' cv. were planted on *Prunus persica* 'Mandżurska' rootstock, in spacing 6 x 2,4 m. Additionally a few experiments with different cultivars of peach trees were established. In every year of yielding fruit were picked individually from each tree.

On the base of these data was estimated the possibility of peach yielding from point of view of changing weather conditions.

RESULTS AND DISCUSSION

In the Lower Silesia region the favorable conditions to peach cultivation appeared from 1988 year. In earlier triennium 1959-1988 were 13 winters with temperature equal or above -20°C (fig. 1). In 1959-1988 years average temperatures of winter months and March were lower in comparison with those in 1989-2003 years (fig. 2). In 1959-1988 years were noted 24 vegetative seasons with frost days which could destroyed flower buds of peach. In 1989-2003 years, the number of frost days after the 10th April was lower. In this period, the frost days in May was not noted (fig.3). In according to Treder [2001], for peach trees, is very danger the period with not high frost at night and warm days. Those danger two days' or three days' frost in May makes up 39% all frost days in the central Poland.

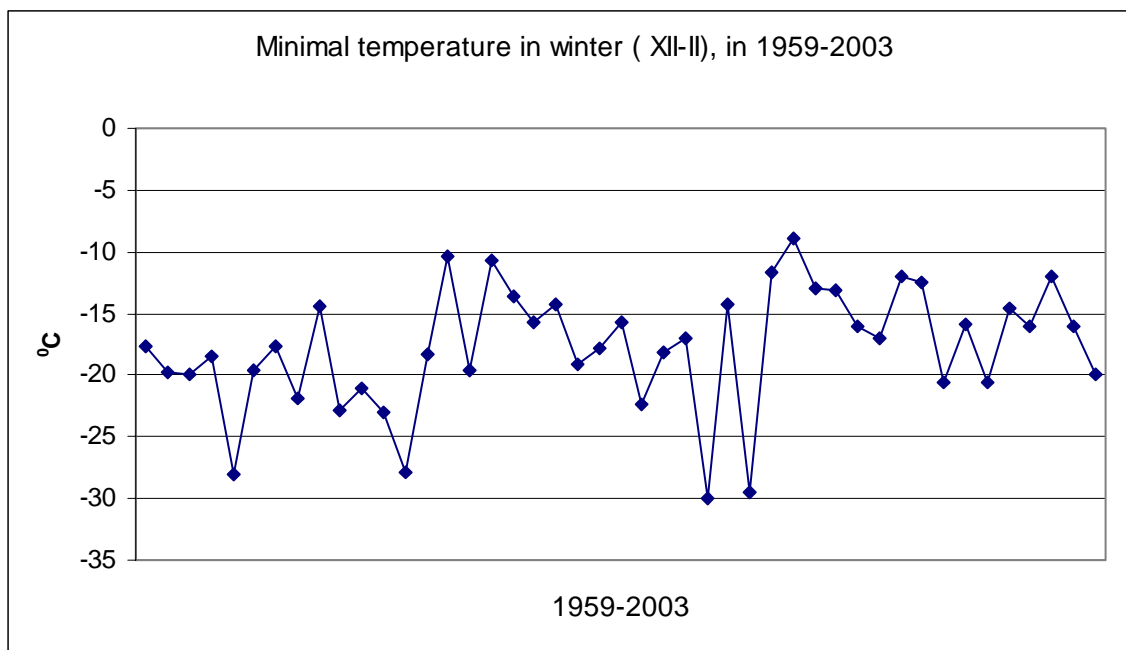


Fig. 1. Minimal winter temperature in Samotwór in 1959-2003 years.

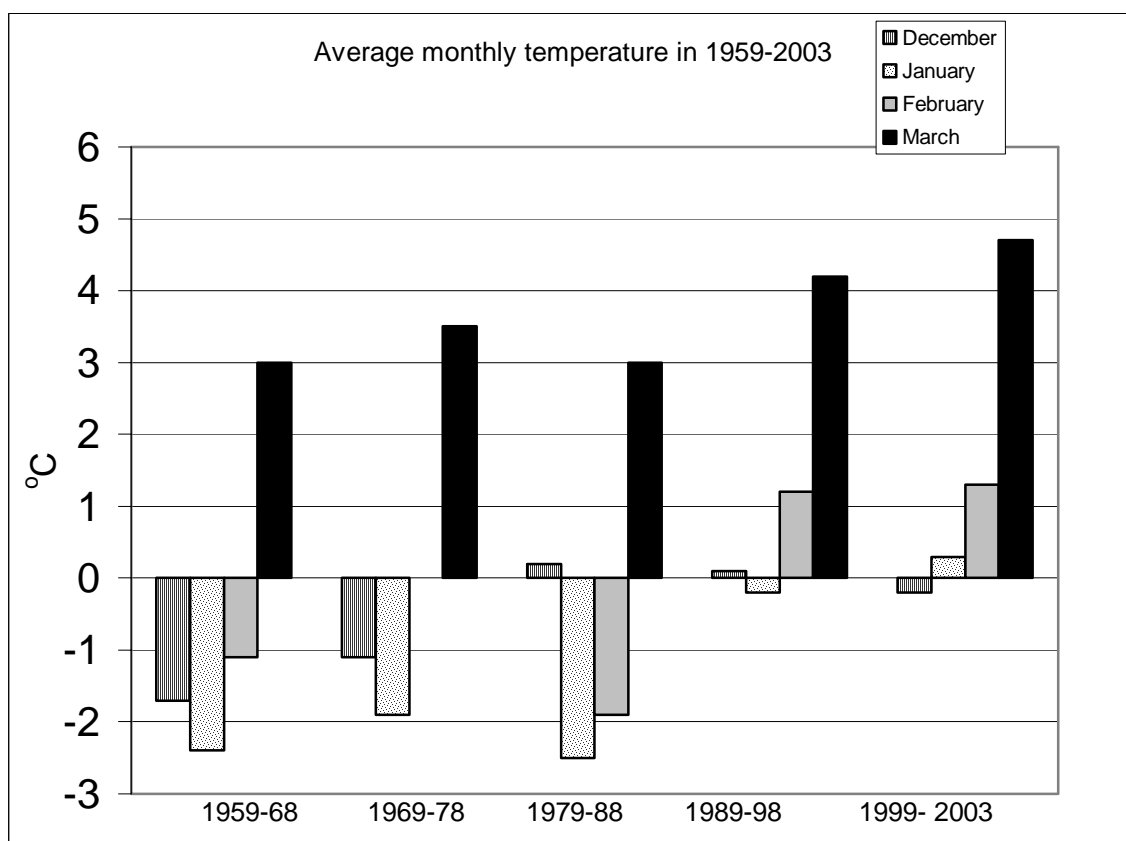


Fig.2. Average temperature in months: December- March in 1959-1998 years

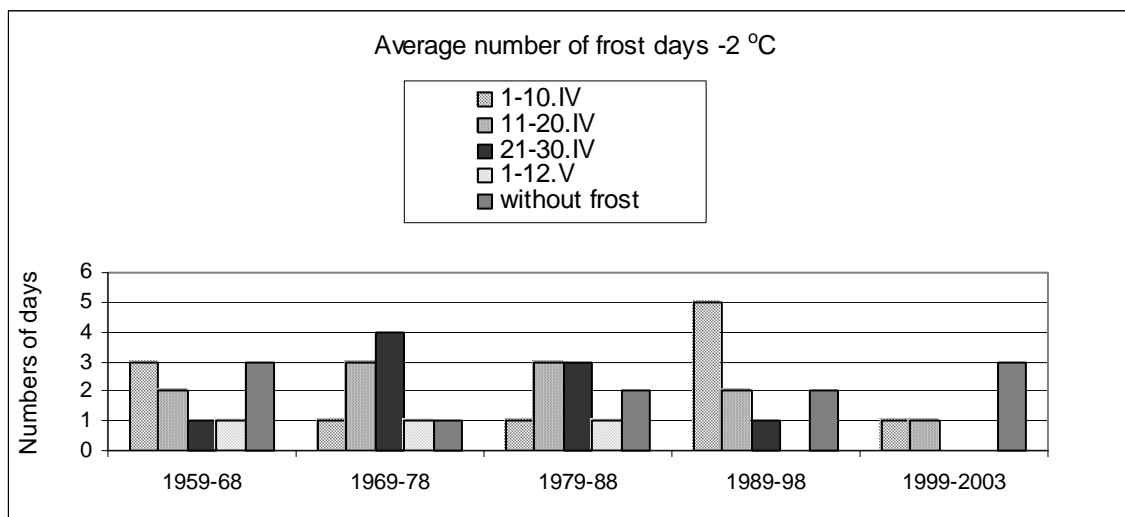


Fig. 3. Average number of days with frost (-2°C) from 1.IV till 12.V. in 1959-2003

The noted minimal temperatures, average temperatures for months: December, January, February and March as well as frost days with -2°C showed more favorable weather conditions for peach cultivation near Wrocław. The favorable course of weather in the winter and in the spring were noted from 1988 year. In 1989-200 years the peach trees did not yield, only once (in 1990). In the last 15 years, from the peach trees obtained 5-52 kg peaches, depend on weather and cultivar (fig.4). The particular yields show figures 5 and 6.

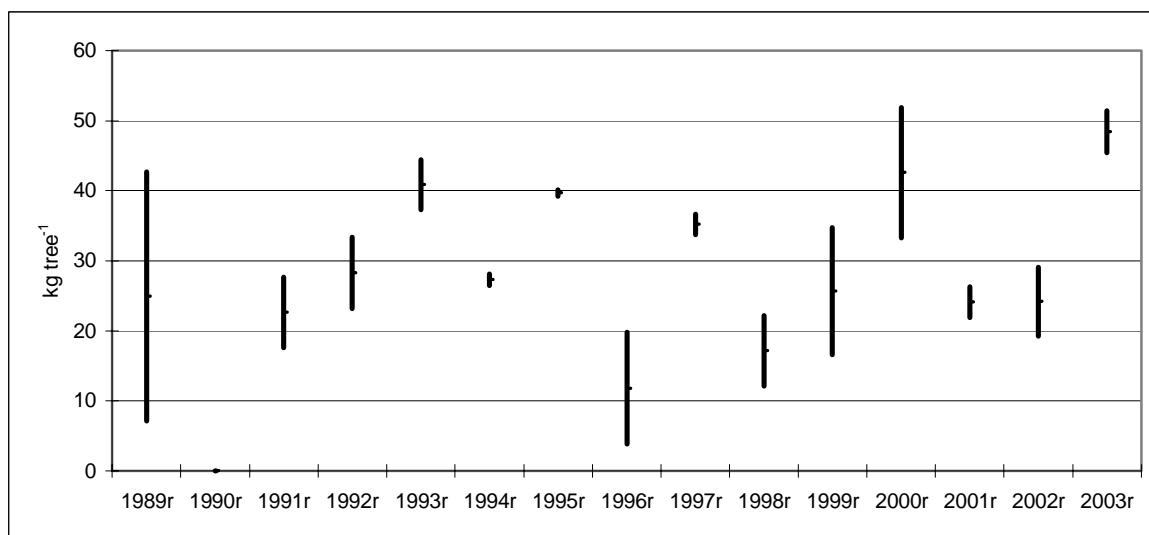


Fig.4. Maximum and minimum yield of peach trees in 1989-2003 years, in region of Lower Silesia

The yield of peach trees was affected by the weather conditions. In the spring of 1990, the frost $-5,9^{\circ}\text{C}$ in 10th April destroyed flower buds all cultivars planted in spring of 1988. The next year, the flower buds were frozen too, in the temperature $-6,0^{\circ}\text{C}$ in 21st April. The frost day caused the fall of yield to 5kg per tree. For the next 4 years (1992-1995) the trees of 'Reliance' and 'Redhaven' cvs. gave the yield on the high level: 28-40 tons per hectare. In January of 1996, temperature fell to $-21,6^{\circ}\text{C}$ and killed most of the buds of 'Redhaven' cv. but trees of 'Reliance' gave about 30 kg per tree. Radajewska i Pisarska [1994] noted destroyed buds by frost in February, in temperature -16°C , near Poznań. The fall of temperature in February is very danger because for the peach tree, the resistance reduction process begin already in the middle of December. In the next 4 years (1997-2000) the trees of estimated cultivars gave high yield-35-85kg per tree. Especially high yield was noted in 2000 year (fig.5).

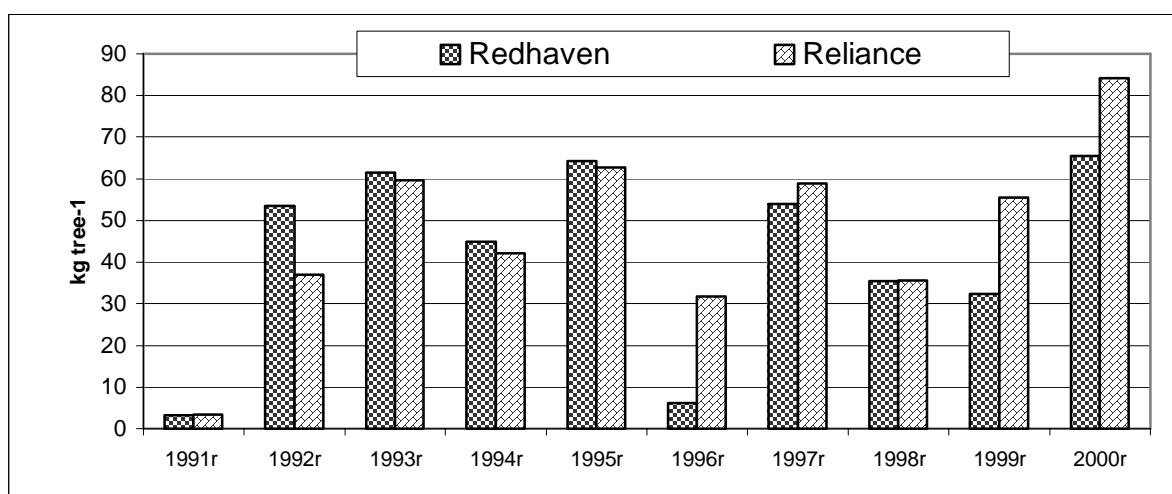


Fig.5. Yielding of 'Reliance' and 'Redhaven' peach trees in 1991-2000.

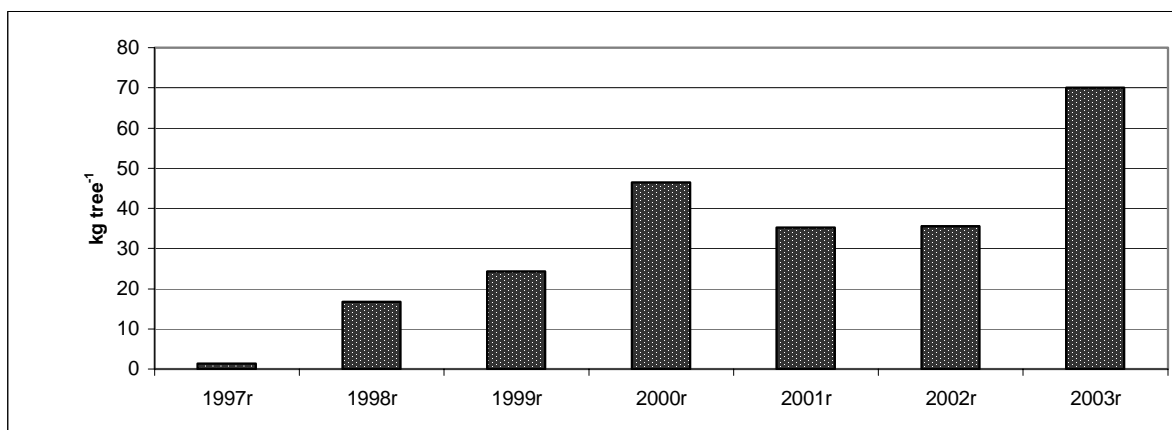


Fig.6. Yielding of 'Inka' peach trees in 1997-2003.

In 1997-2003 years, very high yield was obtained from 'Inka' cv, peach trees. The trees of this Polish cultivar were planted in 1996 year, gave the first yield already in 1997 year. In the next years (1998-2003) the trees gave 15-45 kg peaches from tree. The highest yield from 'Inka' cv. trees was noted in 2003 year- 70 kg per tree that means 48 tons per hectare (fig.6)

Despite of the Lower Silesia is the warmest region of Poland, the cultivation of peach is risk because the low temperature can destroy flower bud in winter and in spring. However the obtained results indicate that the risk is smaller in the last 15 years and the Lower Silesia is suitable for cultivation of peach trees which give high and annual yield.

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