STABILITY OF MORPHOLOGICAL TRAITS IN LATGALE'S MELON LINES

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Abstract

The investigation was carried out from 2006 to 2008 with the aim of observing the stability of morphological traits in Latgale's melon (*Cucumis melo* L.) lines in the Tukums region of Latvia. Four lines of Latgale's melons ('8', '14', '5(2)', and '4(3)') were grown in high plastic tunnels: five plants from each line. The following parameters were measured to determine stability of morphological traits in melons: fruit petiole and flower scar diameters (cm), length and wide of melon fruit (cm), and thickness of flesh (cm). Results showed that there was a significant difference in fruit petiole scar diameter between the years 2006 and 2007 for all lines. The melon line '14' was stable in all parameters from 2006 till 2008 except fruit flower scar diameter. The melon line '4(3)' was less stable in all parameters between all melon lines in all years of investigation.

Key words: *Cucumis melo*, local genotypes, flower scar, petiole scar, fruit length and width, flesh thickness.

Introduction

Melons *Cucumis melo* L. are widely cultivated plants in Central and Southern Europe originated from South Asia and central part of Africa. From these regions (mostly from South Asia) melons have spread around the world (Белик, 1998; Salunkhe, 1998; Лебедева, 2000). Many melon varieties were selected by humans in the entire world since the beginning of melon cultivation (IPGRI, 2003). The melons require high air and substrate temperatures. The recommended sum of effective temperatures (temperature ≥ +10 °C) for melon growth is 3000-5000 °C (Taranovs, 1968). Climatic conditions in Latvia are not suitable for melon growing in open field every season, but it is possible to grow them in plastic tunnels or greenhouses.

In the middle of the past century in Daugavpils region a well-known grape breeder - Pauls Sukatnieks bred several melon cultivars. He worked in Dviete, Latgale's region, and bred such varieties as 'Dvietes Oranžā' and 'Dvietes Banānu'. P. Sukatnieks also developed the growing systems for melons in Latvia (Sukatnieks, 1954). The varieties bred by him were suitable for Latvia's agroclimatic conditions. These varieties were of very short vegetation period, and yielded also in rainy summers (Sukatnieks, 1954).

During several decades these genotypes were destroyed by cross-pollination of different varieties. This unique genetic material was maintained by the gardener Ēvalds Piļka, and scientists Uģis Dēķens and Inese Drudze. Since 2003, a renewal of Latgale's melons was started in Pūre Horticultural Research Centre. Since 2003, inbreeding and sibling was carried out.

The objective of the study was to determine stability of morphological traits in Latgale's melon lines. The main aim of the investigation is to homogenize the genetic material of Latgale's melons.

Materials and Methods

The research was carried out in Pūre Horticultural Research Centre of Tukums region in 2006, 2007 and 2008. Four lines of Latgale's melons ('8', '14', '5(2)', and '4(3)') were used. Five plants were planted from each line.

The melons were sown at the end of April in plastic pots of 8 cm in diameter, in peat substrate with pH_{CaCl2} 5.5±0.5, N – 100-140 mg kg^{-1}, P – 48-74 mg kg^{-1}, and K – 158-241 mg kg^{-1}. The seedlings were grown in pots in a high plastic tunnel till the end of May. Plants were planted in a high plastic tunnel in peat substrate at 0.8 m distance. During the investigations melons were regularly watered and fertilized with $Ca(NO_3)_2$ (1200 g m^{-3} of water) and 'Kemira' 10:10:20 (1750 g m^{-3} of water) every second week.

Harvesting was done when melons were easily separated from the fruit petiole. Measuring of melon parameters was done immediately after harvesting.

The following parameters were measured to determine stability of morphological traits in Latgale's melons: length and width of melon fruit (cm), petiole scar and flower scar diameter (cm) and thickness of flesh (cm).

The vegetation period of 2006 was warmer than one in 2007 and 2008, and the temperature in the high plastic tunnel was high, only the 2nd and 3rd decade of May and the 1st decade of June were cooler in comparison with 2007. The highest temperature was observed in the 1st decade of July in 2006, and the lowest temperature was observed in the 1st decade of May in 2007. The vegetation period of 2008 was cooler in average than one in 2006 and 2007 (Figure 1).

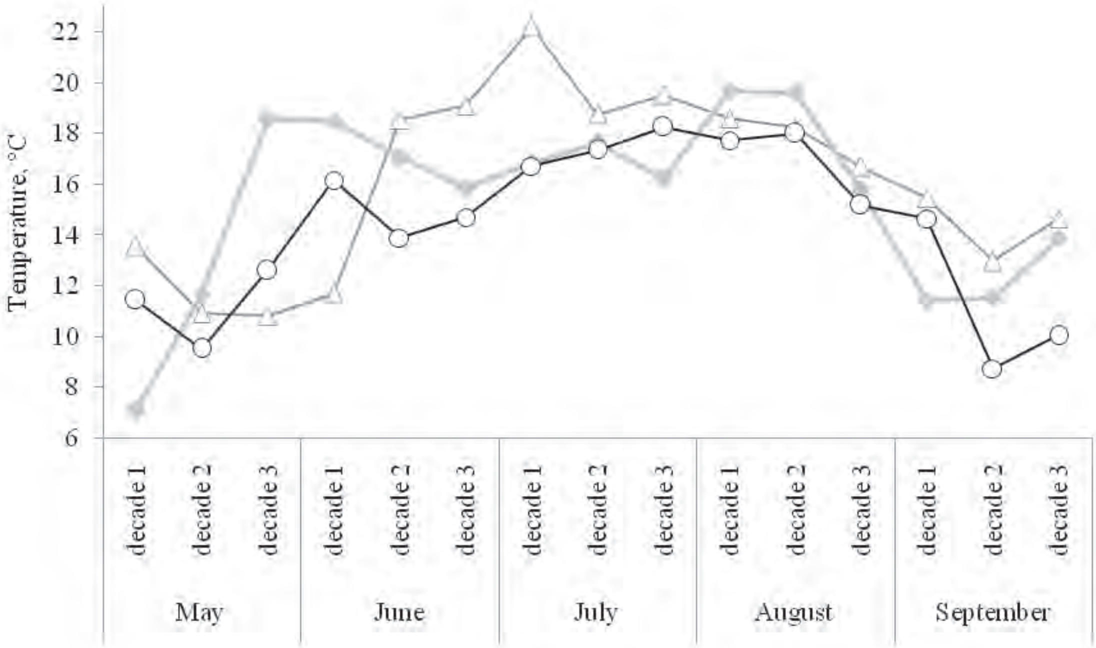

Figure 1. Average outdoor air temperature data of 2006 - 2008

As melons were grown in the high plastic tunnel, the air temperature there was higher and promoted the growth and development of melons. Temperature data were taken from the meteorological station of Pūre Horticultural Research Centre.

Differences between measurements of melon lines were evaluated according to ANOVA. ANOVA two-factor variance with replications was used. P-value was used for stability evaluation.

Results and Discussion

In 2006, 2007 and 2008 the climatic conditions were favorable for the melon growth in high plastic tunnel. The melon growth was depressed only at the beginning of the vegetation period as a result of low air temperatures.

The sum of effective air temperatures in the high plastic tunnel was 2700-2900 °C in average. It should be noted that melons require the sum of effective temperatures between 2800–3200 °C (Фурса et al., 1985; Борисова et al., 1984).

The storage of fruits depends on a fruit petiole scar and flower scar diameter. The scar is a possible focal point of fruit infection by different fungal diseases. (Борисова et al., 1984). The melon lines included in the research are not suitable for a long storage.

The bigger petiole scar diameter was observed for melon lines '5(2)' (1.77 cm), '14' (1.8 cm) in 2006 (Figure 2). The bigger flower scar diameter was observed for melon lines '5(2)' (2.78cm), '14' (2.78 cm) in 2006 and for a melon line 4(3) (2.7 cm) in 2008. It is possible to deny null hypothesis, and the mathematical analyses of the data showed that there was a significant difference between the years according to the fruit petiole scar diameter (P_{max}=0.99). Significant differences were stated for the fruit petiole scar diameter between 2006 and 2007 for all lines, and between 2007 and 2008 for '4(3)', and between 2006 and 2008 for '8', '14', '5(2)'.

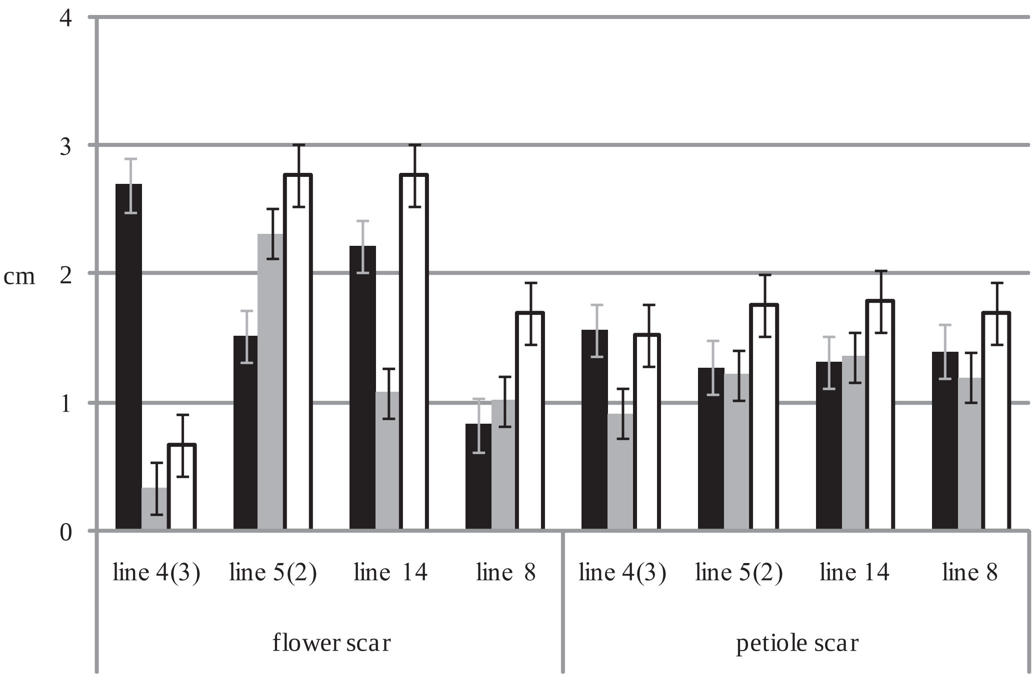

Figure 2. Fruit flower and petiole scar diameters.

■ 2008 ■ 2007 □ 2006

Insignificant interconnections were found between years for the fruit flower scar diameter. With probability P=95% it is not possible to deny null hypothesis – the fruit flower scar diameter is not dependent upon the year. Maximum probability for significant influence for the fruit flower scar diameter parameter between years is P_{max}=0.5566.

The average fruit length and width were higher for melon lines '5(2)' and '4(3)' (Figure 3).

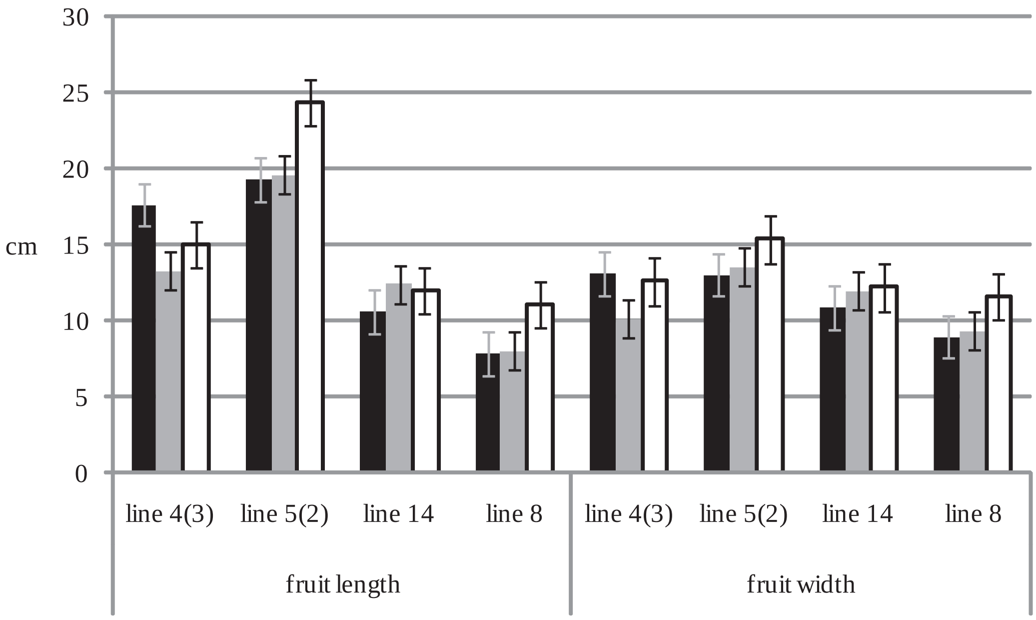

Figure 3. Fruit lenght and width diameters.

■ 2008 ■ 2007 □ 2006

Insignificant interconnection was found between years for the fruit length parameter. With probability P=95% there is not possible to deny null hypothesis – the fruit length and width parameters are not dependent upon the year. Maximum probability for significant influence for the fruit length parameter between years is P_{max}=0.1683, and for the width parameter - P_{max}=0.58.

The thickness of fruit flesh is important morphological parameter. If the cavity of seeds is smaller, the weight of fruit will be higher. Thicker flesh was observed for the melon line '5(2)' (4.4 cm) in 2006 (Figure 4). Fruit thickness of flesh depends from genotype.

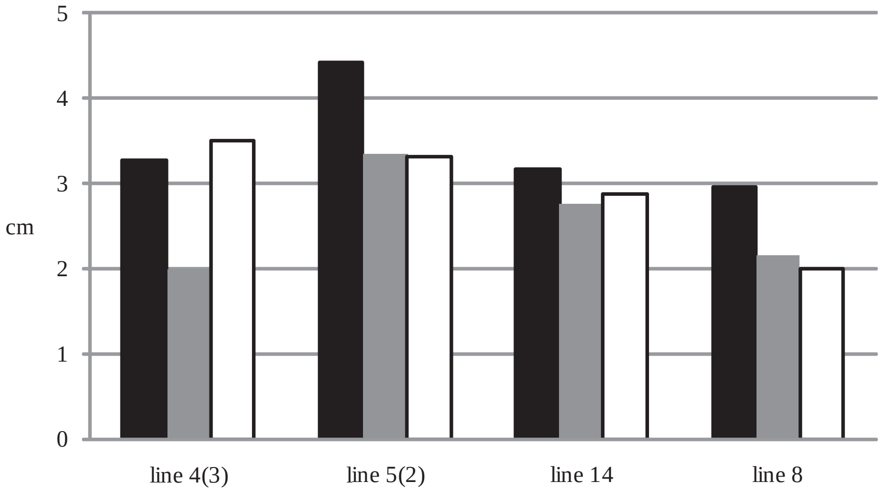

Figure 4. Fruit flesh thickness.

■2006 ■2007 □2008

Insignificant interconnection was found between the years for the fruit thickness. With probability P=95% there is not possible to deny null hypothesis – the fruit thickness is not dependent upon the year. Maximum probability for significant influence for the fruit thickness parameter between the years is P_{max}=0.7963.

To assess parameters which were included in research, the highest stability was observed at the melon line '14'. There was found insignificant interconnections between parameters. The melon line '4(3)' was less stable in all parameters. There was found significant interconnections between parameters. P-value was used for stability evaluation. The parameter is stable if its value year to year does not change with probability 95%.

Conclusions

1. The mathematical analyses of the data showed that there was a significant difference for the fruit petiole scar diameter between 2006 and 2007 for all lines.
2. The line '14' was stable in all parameters from 2006 till 2008 except the fruit flower scar diameter.
3. The line '4(3)' was less stable in all parameters between all melon lines in all years of investigations.

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