

Table of Contents

In Press

Article Archive

HORTSCI (45) 2018

HORTSCI (44) 2017

HORTSCI (43) 2016

HORTSCI (42) 2015

HORTSCI (41) 2014

HORTSCI (40) 2013

HORTSCI (39) 2012

HORTSCI (38) 2011

HORTSCI (37) 2010

HORTSCI (36) 2009

HORTSCI (35) 2008

HORTSCI (34) 2007

HORTSCI (33) 2006

HORTSCI (32) 2005

Issue No. 1 (1-41)

Issue No. 2 (43-83)

Issue No. 3 (85-122)

Issue No. 4 (123-162)

HORTSCI (31) 2004

HORTSCI (30) 2003

HORTSCI (29) 2002

Editorial Board

Ethical Standards

Reviewers 2017

For Authors

Author Declaration

Instruction for Authors

Submission Templates

Guide for Authors

Copyright Statement

Fees

Submission/Login

For Reviewers

Guide for Reviewers

Reviewers Login

Subscription

Polyploidy effects on frost tolerance and winter survival of garden pansy genotypes

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This study was conducted to interpret the differences in frost tolerance and winter survival between 8x, 10x, 12x, 14x, and 16x ploidy levels of garden pansy (*Viola × wittrockiana* Gams) genotypes grown in the field conditions. Plants of each genotype were analyzed for their ploidy levels using flow cytometry. The chlorophyll fluorescence parameters were measured with portable chlorophyll fluorometer in the greenhouse and in the field at different time intervals. Increased frost stress generally reduced the fluorescence values in all genotypes. However, the genotypes differed significantly in their responses to frost as they were exposed to minimum temperatures of 1°C to -7.7°C in the field. Based on the percentage reduction in F_V/F_M values against -7.7°C temperature the hexadecaploids were ranked as sensitive to intermediate followed by 12x (sensitive), and genotypes with 10x and 14x ploidy levels were tolerant as the controls. The winter survival rate of hexadecaploids was by 7 to 9% lower than in the controls followed by the genotype with 12x and both genotypes with 10x and 14x ploidy levels were about equal to the controls. On the other hand, the content of photosynthetic pigments (chlorophyll *a*, *b* and total carotenoids) was the highest in hexadecaploids and tended to increase with increasing ploidy level. Further, the results gave insight that chlorophyll fluorescence could be applied directly in the field conditions to screen genotypes and select plants having higher frost tolerance in combination with improved aesthetic qualities.

Keywords:

Viola × wittrockiana; garden pansy; induced polyploidy; photosynthetic pigments; flow cytometry; chlorophyll fluorescence; frost tolerance

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