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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 8*x*, 10*x*, 12*x*, 14*x*, and 16*x* 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 12*x* (sensitive), and genotypes with 10*x* and 14*x* 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 12*x* and both genotypes with 10*x* and 14*x* 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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