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PHENOTYPIC PLASTICITY AND QTL MAPPING OF BUD SET PROCESS IN *POPULUS NIGRA*

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The seasonal growth cycle of trees, such as bud break, growth, bud set and dormancy are distinct characters of perennial plants and represent a basic adaptations to their environment. The variability of the phenology of growth cessation and bud set correlates strongly with the latitude allowing the trees to find a compromise between the necessity to avoid the risk of frost damage and to maximize the length of the growing season. Even if photoperiod is widely accepted to be the main environmental signal for bud set in poplars, the timing of bud formation is also influenced by other factors such as temperature, temperature x photoperiod interaction, nutrition and drought. Research efforts to characterize the genetic basis of growth cessation and bud formation are of paramount importance to better understand the mechanisms at the basis of these traits. Besides, the role of phenotypic plasticity as a source of variability to determine short- and long-term plant response in different environment, can be used to evaluate the possibility of temperature-mediated plasticity in some genotypes more adapted to specific environmental conditions. A new protocol has been proposed recently to dissect the growth cessation in poplar and bud set key traits (phase, duration, sub-period) were defined to better characterize the bud set process. Data analysis has allowed to decompose the contribution of the different phenological traits to the dynamics of bud set in a *P. nigra* full-sib family (POP5) planted in two sites in central and northern Italy. Genetic variability, broad-sense heritability and phenotypic plasticity of these traits have been studied and QTLs analysis for the most discriminative traits has been performed using a multisite approach. Results showed that the onset of growth cessation is a quantitative trait under strong genetic control. Night length is the most important signal triggering the physiological process but the role of other environmental factors, such as temperature, increase during the process. Taking advantage of the two contrasting experimental sites a considerable role of GxS interaction has been found in all the different phenological phases and the low temperature seems to influence the sensitivity of some more plastic genotypes. QTLs identified in the POP5 genetic map, each one characterized by small

or modest effect, highlight the complex nature of the traits involved during the apical bud formation-maturation process.