
We investigated differences in response capacities among genotypes of six populations of *Calamagrostis epigejos* across three levels of soil fertility. Substrate effects were highly significant (P<0.001) for all characters (total biomass, root biomass, rhizome biomass, shoot biomass, root allocation, rhizome allocation, shoot allocation, vegetative tiller number, plant height, leaf-blade length, leaf width), indicating a high amount of plasticity. Population effects were highly significant (P=0.001) for all characters, except for leaf width and shoot allocation. There were also significant genotype effects for most characters as well as genotype-environment interactions. Plastic responses of most characters were correlated to each other, indicating a high degree of phenotypic integration. Root allocation was negatively correlated with rhizome allocation, revealing an inversely related allocation pattern between roots and rhizomes. Rhizome biomass was the character with the highest mean amount of plasticity over all populations (mean CV: 48.7±13.6), whereas leaf width showed lowest plasticity with a mean CV of 9.0±4.6. Character means and CVs over the six populations were not correlated, except root allocation and plant height. These results confirm the view that genotypic differentiation for the character mean and the amount of plasticity is independent from each other. It was striking that the population from the most stressful habitat (a copper smelter) showed the lowest amount of plasticity. This is in accordance with the specialization hypothesis, which suggests that clones specialized to stressful environments show less plasticity in fitness traits than genotypes specialized to non-stressful environments. The great success of *C. epigejos* over a variety of contrasting habitats is due to both a high degree of phenotypic plasticity of individual genotypes and a considerable amount of genotypic variability within populations.

*Keywords*: Allocation; Clonal plants; Genotypic variability; Local adaptation; Norm of reaction; Nutrient gradient; Phenotypic integration; Specialization