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Influence of three soil moisture levels on early growth and proline content of some faba bean genotypes

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Abstract : Ten faba bean (*Vicia faba* L.) genotypes were evaluated under three soil moisture levels in two pot trials during 2014/2015winter season. When the plants were 30 days old, they were subjected to three treatments of watering for a period of 20 days. The levels were 70% of the available soil-water capacity, AW (represented the normal irrigation; N), 45%, and 20% of AW (represented medium (M), and severe water stress (S), respectively). The objectives were to explore the extent of variation among faba bean genotypes in early growth stage under variable soil drought-prone conditions with different climatic factors.

Moisture levels were the most important source of variation for early growth parameters as well as leaflet RWC% and proline content of faba beans than genotypic differences or interactions. Combined analysis over both environmental conditions, proved that the accumulation of dry matter and its allocation in various organs of different faba bean varieties during the early growth stages and their tissues hydration and proline content depended greatly on climatic factors (particularly growing thermal units) and soil moisture. The rates of changes (regression coefficients) due to the reduction of AW were significantly negative for all traits except for Root/Shoot Dwt, relative root to plant Dwt and Proline content, which significantly increased as soil moisture decreased. This proved that the tested faba bean genotypes possessed intrinsic mechanisms of responses to water deficit during the early stage of growth.

Faba bean genotypes: M.1, M.3, C.4 and N.1 appeared to be the most sensitive ones since their lower RWCs under stress conditions accompanied to higher rates of RWC reductions. In spite of that cultivar C.5 shared C.4 in highest rate of RWC reduction (b=-0.72**), the first maintained significantly higher RWC (=55.71%). This may be due to the highest rate and content of increase proline (b=0.010** & 5.74 mg g^{-1} fresh wt) of C.5, which is two folds as much as higher of C.4 (b=0.05**& 3.83 mg g^{-1} fresh wt). Cultivars exhibited lower declines of RWC due stress corresponded to higher contents of moisture in the tissues of leaflet may be considered as tolerant to water stress (i.e G.843 and C. 49).

Our calculations revealed that the levels of proline of C.5 grown under medium (M) and water stress (S) conditions contributed 5.3% and 12.8% of the total osmotic potential. The percentages contribution of proline to the total predicted osmotic potential of the genotype C.5 indicates that this amino acid might play a role in the overall osmotic adjustment of the cells.

Keyword: *Vicia faba*, Genotypic variation, Watering regimes, Dry matter, G.D.D, RWC, Proline, Drought tolerance, Drought sensitive.

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