DEFICIT IRRIGATION IMPROVES SAPONINS CONTENT IN DIFFERENT COMMON BEAN PLANT TISSUES

Mayra Denise Herrera  
INIFAP-CEZAC

Miguel Servín Palestina  
INIFAP-CEZAC

Eduardo Alonso Longoria Aguero  
INIFAP-CEZAC

Olivia Gabriela Rosales Bugarín  
INIFAP-CEZAC

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DEFICIT IRRIGATION IMPROVES SAPONINS CONTENT IN DIFFERENT COMMON BEAN PLANT TISSUES

Mayra Denise Herrera, Miguel Servín Palestina, Eduardo Alonso Longoria Aguero, Olivia Gabriela Rosales Bugarín.


INTRODUCTION: Common bean plants are often subjected to water deficiency due to the large extent of territory destined to production under rainfed conditions, which may lead to a critical abiotic stress that affects plant physiology and development. Plants that are exposed to drought stress generally produce higher levels of secondary metabolites, including triterpenoids such as saponins (Nasrollahi et al., 2014). The objective was to quantify the total saponins content of different plant tissue of two Flor de Junio (FJ) common bean cultivars.

MATERIAL AND METHODS: Cultivars FJ Dalia and Victoria were sown in July 2016 at the INIFAP-Zacatecas Research Center, under a rainout shelter to protect against rainfall; plants were subjected to different water supply regimens: 1, 50/50 % of water availability in vegetative/reproductive stage; 2, 100/100; 3, 50,100 and 4, 100,50. Root and foliar tissue were collected when plants reached the reproductive stage, samples were immediately freeze dry and processed in a domestic grinder. In brief, total saponins were extracted adding 4 mL of hexane to 0.5 g of dry sample, after shaking for 6 h, samples were centrifuged and acetonitrile was added to the hexanoic extracts (Hiai et al., 1976). Total saponins quantification was conducted on the basis of a reaction with vanillin and sulfuric acid. Results were expressed as µg equivalent of oleanolic acid/gram of dry sample (µg OAE/g).

RESULTS AND DISCUSSION: It has been reported that saponins are phytochemicals significantly influenced by factors that compromise an environmental stimulus such as water supply in crops, and the increase of these compounds can be achieved by applying special moisture regimes during the crop cycle (Szakiel et al., 2011). Figure 1 shows significant differences in the total saponins content of root tissue among treatments and cultivars evaluated. FJ Dalia exhibited a greater capacity of synthesis in comparison to FJ Victoria, which indicates that, regardless of the water supply treatment, genotype is an important trait. Although saponins concentration of this cultivar was higher due to the effect of the well-watered treatment, the foliar tissue had the highest amount of this compounds due to a water deficiency during the reproductive stage (Figure 2). Our results are in accordance with Nasrollahi et al. (2014) who mentions that modifying the soil moisture availability, it may be possible to improve the production of saponins in agricultural crops, however, this depends on the plant tissue and the cultivar’s genotype. In this context, FJ Victoria had a different tendency, since the maximum concentration of saponins in the root tissue was found in plants subjected to water deficiency during the whole cycle, while foliar tissue displayed a higher synthesis in the well-watered plants.
Figure 1. Total saponins content in plants root tissue of two common bean cultivars. Values are presented as mean ± SD. Means in the same bar with a common letter are not significantly different (p<0.05, Tukey).

Figure 2. Total saponins content in plants foliar tissue of two common bean cultivars. Values are presented as mean ± SD. Means in the same bar with a common letter are not significantly different (p<0.05, Tukey).

REFERENCES: