

Progetto OCSPIAA: “Ottimizzazione delle tecniche colturali per la Stevia rebaudiana Bertoni per la produzione di integratori e additivi alimentari

Abstract

Stevia is a plant native to Paraguay, known since centuries for its sweetening proprieties. Stevia extracts have been used for decades in Japan, China, Brazil, and US, but in Europe the interest is recent as only in 2011 the European Commission authorized their use.

As the information on the most appropriate cultivation techniques, in particular in our environments, are little this project was aimed at characterizing stevia product and evaluating the effect of agronomic treatments on production and quality.

The experiments carried out in the first year were intended to characterize stevia for content of steviol glycosides and other secondary metabolites (e.g. antioxidants). Secondly, they also investigated on how some agronomic aspects, such as fertilization and irrigation, affect stevia yield and quality. In the trial Pojana Maggiore the dose of fertilizer did not impacted production and quality. The micro-irrigation method, compared to sprinkler irrigation, increased stevioside and rebaudioside A in the foliage and stems, and almost all antioxidants.

At Padova University, the doses of N, P and K fertilizers did not significantly affected concentration and production of secondary metabolites of the plant, with the exception of fructose sugar.

In the following years, the field experiments were refined to better assess the effects, in operating conditions, of three doses of N and K and two irrigation methods, in two locations. The limited effects achieved also with very different doses of nitrogen, have suggested to carry out more trials aimed at assessing the nutritional needs of stevia. Thus greenhouse experiments where plants, where grown in pot, were set up, thus all inputs have been checked.

In the experiments conducted in 2013 and 2014 at Pojana Maggiore and Orgiano, fertilization with K never affected yield, while the micro-irrigation favored production of biomass but only in 2014 and only in Pojana Maggiore. With regard to N dose, at both locations, significant increment of production were achieved already with N2.

With regard to the effects of concentration and production of steviol glycosides at Pojana Maggiore increasing the dose of N always reduced the concentrations of stevioside, but only in 2014 the production was reduced. At Orgiano, however, in 2014 the dose of N2 improved stevioside production.

At Pojana Maggiore, in 2014, the dose N2 encouraged concentration and production of rebaudioside and, at Orgiano, only productions. For these parameters, rare influences of doses of K (in favor of K1) and irrigation method (in favor of micro-irrigation) were observed.

Ultimately, the total production of steviol glycosides was improved, at Orgiano and in 2014, by N2 and N3 doses.

The experiments carried out at the University, highlighted the importance of N to promote yield and quality of stevia. In both years, in fact, the increase in dose led to an increase in production of leaves and whole above ground part of plant.

Concerning P and K: P3 promote the production of leaves in 2013 and of the aerial biomass in 2014; K2 favored the production of leaves and in 2013, K3 was negative in 2014.

The steviol glycosides decreased with increasing dose of N, but only for stevioside and only in 2014. However, in some cases the yield was favored by N: N3, in 2014, increased stevioside and, in 2013, N3 the rebaudioside A at both cuts and; in 2014, N3 improved rebaudioside only at the first cut.

The concentrations of nutrients and their uptake increased with increasing dose of the that specific nutrient. Moreover, in both years, uptakes of P and K were increased by the dose of N also.

The results obtained in the protected environment highlighted the good needs of N of stevia and the modest requirements in P and K. Thus, considering only steviol glycosides production, the more appropriate doses to get the higher yield were N3, P1 and K1.