USE OF CO-PRODUCTS FROM THE TABLE OLIVE PREPARATION PROCESS AS FERTILIZERS IN THE PROCESSING TOMATO CROP

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INTRODUCTION

Spain is the leading producer and exporter of Table Olives, producing more than 500,000 tons per year. The most significant challenges that the sector encounters are the high water consumption required for these processes, the large amount of pollutants they generate. These effluents are technically and economically very difficult to purify. There are currently two types of solutions used in the olive industry, neither of which has succeeded in completely eradicating the problema, while maintaining cost effectiveness and sustainability in the industry. Both solutions are highly contaminating from the point of view of the microorganisms produced in the aquifers and the lethal effects of sodium, which render it useless for spreading on crops. The object of this study is to significantly reduce, if not eliminate, the residues produced in the industrial dressing process, through the substitution of sodium hydroxide (caustic soda) with another type of alkaline lye, in the form of potassium hydroxide. This study will focus on evaluating this co-product from the olive industry as a fertilizer to be applied to the industrial tomato crop.

MATERIALS & METHODS

A field trial was proposed in the experimental farm of CTAEX throughout the 2016 and 2017 campaigns, in which 3 fertilizer treatments were compared: 2 treatments with co-products obtained the olive residues, one with sulfuric acid (GB1), and the other with phosphoric acid (GB2) and the third, a control treatment in which no co-product was applied. Mechanized transplantation was carried out with a planting density of 30,000 plants/ha. Fertilization of the trial followed the "standard" fertilization plan designed for the industrial tomato crop in the CTAEX experimental farm. This consisted of providing the following fertilizer units to the crop: 160 N, 75 P, 150 K and 48 Ca. The fertilizer products applied during the cultivation cycle are incorporated into the soil by fertirrigation, and through localized irrigation. In the test fields GB1 and GB2, the 0-0-15-0 fertilizer was not applied, as the diluted residue water was applied instead: 1,430 L/ha of sulfuric water residue (0N-0P-150K -0Ca) and 1,570 L/ha of phosphoric water residue (0N-6P-150K-0Ca). The crop was monitorized throughout the crop cycle. At harvest, agronomic and technological parameters were determined.

RESULTS & DISCUSSION

The soil presents no salinity problems with the pH being suitable for the assimilation of most nutrients. The nitrogen content and organic matter present in this soil are very low. The organic matter content and the C/N ratio provide information on the assimilable nitrogen that the soil will produce throughout the crop cycle. It should be noted that the location of the trial is in a designated vulnerable area (Order March 7, 2003) in relation to nitrates, which should in no case exceed 200 UF/ha of nitrogen for the industrial tomato crop.

Table 1. Agronomic parameters I. 2017.

Treatment	Gross yield (kg/ha)	Acceptable raw material (kg/ha)	Overripen fruits (%)	Green fruits (%)
GB1	77037 ± 2522	58296 ± 2583	4.88 ± 0.63	13.32 ± 1.90
GB2	76000 ± 8151	56296 ± 5602	3.12 ± 0.90	18.18 ± 1.13
GB3	85630 ± 7135	64963 ± 4876	2.74 ± 0.41	17.94 ± 1.38
P	ns	ns	ns	ns

Significance: ns=no differences.

Table 2. Agronomic parameters II. 2017.

Treatment	Average weight fruit (g)	Disease fruits (%)	Sun damaged fruits (%)	Blossom-end rot fruits (%)
GB1	56.25 ± 2.04	0.58 ± 0.17	3.43 a ± 0.49	2.10 ± 0.45
GB2	54.19 ± 1.21	0.85 ± 0.26	2.35 ab ± 0.27	1.31 ± 0.22
GB3	56.41 ± 1.32	0.77 ± 0.09	1.52 b ± 0.27	1.05 ± 0.08
P	ns	ns	*	ns

Significance: ns=no differences.

Fruits for each treatment at harvest time, 17/08/2016

Tabla 3. Technological parameters I. 2017.

Treatment	pH	Lycopene (mg/kg)	º Brix	Viscosity (cm/30s)	Potassium (pp
GB1	4.64 ± 0.02	106.42a ± 1.97	5.41 ± 0.07	28.00 ± 1.54	2417.33 ± 36.1
GB2	4.59 ± 0.01	106.36a ± 7.63	5.54 ± 0.07	23.53 ± 0.95	2611.33 ± 60.3
GB3	4.55 ± 0.03	68.14b ± 8.15	5.38 ± 0.01	26.33 ± 0.37	2489.67 ± 90.8
P	ns	*	ns	ns	ns

Significance: ns=no differences; *=P<0.05; **=P<0.01; ***=P<0.001.
a, b = different letters mean significative differences among treatments, P<0.05. Tukey Test.

Tabla 4. Technological parameters II. 2017.

Treatment	Firmness	L*	a*	b*
GB1	5550.2 ± 760.6	23.94 ± 0.47	25.31b ± 0.29	12.30 ± 0.09
GB2	6270.6 ± 380.8	23.36 ± 0.36	26.33a ± 0.09	12.71 ± 0.30
GB3	5404.4 ± 542.6	23.63 ± 0.07	25.66ab ± 0.24	12.48 ± 0.27
P	ns	ns	*	ns

Significance: ns=no differences.

CONCLUSIONS

The application of the co-products from the table olives process as potassium fertilizer was suitable for the processing tomato crop. The nutritional levels in the two trial seasons were normal both for the treatments that applied co-products from the olives, and for the control treatment with mineral fertilizers. Likewise, the agronomic parameters were also normal for the crop and for the area, both the parameters related to yield and those related to the health of the fruit. However, it seems that some quality parameters for tomatoes were slightly improved with the application of the co-product from table olives as a source of potassium, such as soluble solids content, lycopene and red colour.

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