

RESIDUE LEVEL OF CHLORPROPHAM IN *SOLANUM TUBEROSUM*, BEFORE AND AFTER WASHING

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Abstract. Potatoes can't be stored in very low temperature conditions that it is way Chlorpropham has grown in popularity as a sprout suppressant for long term storage of potatoes. The residue level of Chlorpropham in Christian and Roclas potatoes varieties, before and after washing, was analyzed using LC/MS/MS. The samples were extracted in an easy 3 step method using ethyl acetate. 0.27 mg/kg Chlorpropham residue was found in Roclas and 0.23 mg/kg in Christian. There was a decrease in the Chlorpropham concentration in the whole potato by 30.43-37.04 %. There was no significant difference between the 2 potatoes varieties, Christian and Roclas, in the % in which Chlorpropham residue was reduce after washing. Results indicated that the washing operation significantly reduces the Chlorpropham residue level in potatoes.

Keywords: Chlorpropham, potato, washing, Isopropyl(3-chlorophenyl)carbamate, Liquid chromatography, Mass spectrometry

INTRODUCTION

The potato (*Solanum tuberosum*) belongs to the solanaceae family of flowering plants. It originated and was first domesticated in the Andes mountains of South America. [1] One hectare of potato can yield two to four times the food quantity of grain crops. Potatoes produce more food per unit of water than any other major crop and are up to seven times more efficient in using water than cereals. [1] They are produced in over 100 countries worldwide. [2] Potatoes are grown in Romania on 186233 ha with a production of 2689733 tons in 2016 [2]. The average consumption of potato in Romania is of 98.6 kg per capita, in 2013, with 1.13 % more than the last year significantly, more than Bulgaria with 31.4 kg per capita and, Hungary with 50.6 kg per capita [2, 3]. In Romania, most of the potatoes are bought in raw form and only a low portion of the 98.6 kg per capita are processed potatoes. [4] Chlorpropham is the mostly commonly found pesticide residue in potatoes because it is used as sprout suppressant due to the fact that storage temperature for potatoes need to be higher on safeguard fry color [5]. The purpose of the study is to evaluate the impact of the washing operation of potatoes on the concentration of Isopropyl(3-chlorophenyl)carbamate (Chlorpropham), which is a plant growth regulator and a herbicide used as a sprout suppressant for long term storage of potatoes.

MATERIAL AND METHODS

Sample and sample preparation. Christian and Roclas were the two potatoes varieties analyzed from the Cluj County, 4 Months after their harvest. The potatoes were analyzed as a whole. The laboratory samples were homogenized in a food processor and immediately divided into test portions. Sample extraction was done according to EURL-FV [6]. 10 grams of homogenized sample with 3 g NaHCO₃ and 10 g Na₂SO₄ were extracted with 20 ml ethyl acetate for 3 minutes in an ultrasonic bath. The sample was then centrifuged

for 3 minutes at 3200 G. The supernatant was filtered on 0.2 µm PTFE filter and then injected to the LC MS MS.

Reagents and standards. All the reagents were HPLC or Opti grade from Merk, ultra-pure water was obtained using EVOQVA Siemens, the Chlorpropham analytical standard 99, was PESTANAL, from Sigma Aldrich. Standard solution was prepared in methanol at a concentration of 100 mg/L. A calibration curve was done in 5 point from 0.1 to 0.5 mg/L. Samples where spiked with 100 µg/L Chlorpropham solution for recovery calculation.

Instrumental and chromatographic conditions. An Agilent 1200 HPLC system equipped with degasser, binary pump, autosampler and thermostated column oven was used. HPLC separation was carried out on Agilent SB-C-18(4.6 mm x 150 mm, 1.8 µm) using a gradient of ultra-pure water/ methanol + 5 mM ammonium formate; flow rate of 300 µL/min, a column temperature of 25°C and a 20 µL injection volume. The analysis was performed using a 3200 Q TRAP LC/MS/MS System from AB Sciex TurboV, Electrospray Ionization (ESI) probe operating in positive mode, using the following operation parameters: Curtain Gas: 38 psi; IonSpray Voltage: 5 kV; Nebulizer Gas 1: 40 psi; Turbo Gas: 50 psi; Source Temperature: 500 °C; Entrance potential: 8 V; Collision cell entrance potential: 18V; Precursor ion: 214; Product ions: 172, 154. The scheduled MRM (Multiple Reaction Monitoring) algorithm was used for best accuracy and reproducibility.

Experimental conditions. 200 kg of potatoes from Christian and Roclas varieties were washed using the CALIPSO Root Washing Module, which was developed during the 9BG from 01/10/2016 research financing contract. The module consists of the following subassemblies: Feed tray; Washbasin; Washing drum; Feeder; Drum and conveyor drive mechanism; Ramp with nozzles for additional washing. The potatoes where analyzed before washing and after washing.

RESULTS AND DISCUSSION

The recovery of Chlorpropham from the potatoes samples was between 89.2-91.9 % (table 1).

Table 1.

Crt.no.	Variety name	Recovery (%)
1.	Christian	89.2
2.	Roclas	91.9

The results obtained before washing and after washing are presented in table 2. There was a decrease in the Chlorpropham concentration in the whole potato by 30.43-37.04 %. A higher concentration of Chlorpropham, of 0.27 mg/kg was found in Roclas comparing with 0.23 mg/kg in Christian.

Table 2.

Crt. no.	Variety name	Residue level of Chlorpropham before washing (mg/kg)	Residue level of Chlorpropham concentration after washing (mg/kg)	Chlorpropham residue level drop after wash (%)
1.	Christian	0.23	0.16	38.6
2.	Roclas	0.27	0.17	37.3

A comparison of the results obtained for each variety, before and after washing, is presented in figure 1.

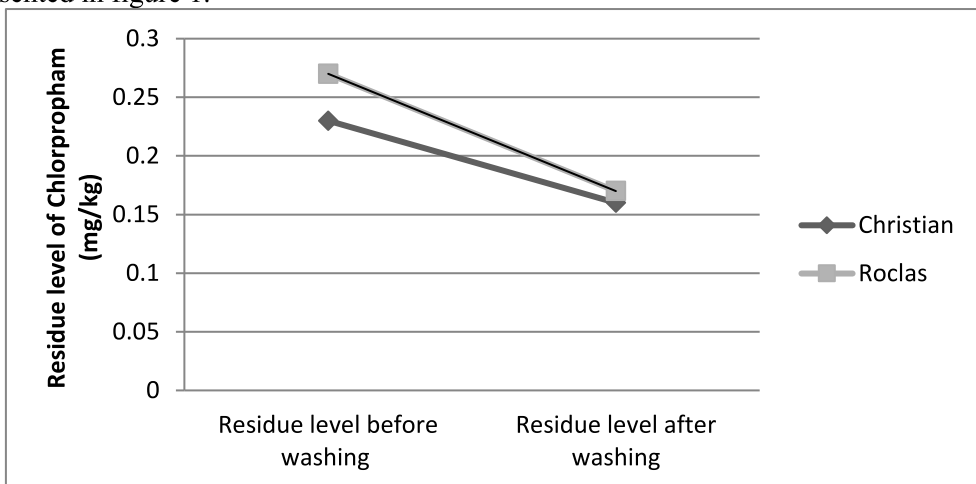


Figure 1. Comparison of the results residue level of Chlorpropham (mg/kg) Christian and Roclas

There is significant difference between Chlorpropham residue level drop after wash between the Christian and Roclas varieties.

CONCLUSION

The washing process has a significant impact on the residue level of Chlorpropham in Christian and Roclas potatoes varieties. The washing process at industrial level after storage, and before selling will ensure that the potatoes that will be sold in different market places will have a low pesticide residue concentration. A low residue concentration will ensure that healthier products will be bought by consumers.

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