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IMPROVING FRUIT QUALITY OF CRIMSON SEEDLESS GRAPES BY ETHEPHON AND ABSCISIC ACID FOLIAR APPLICATIONS WITH NEW SPRAYING MACHINES

By

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B.Sc. Agric. Sc., (Horticulture), Fac. Agric., Al-Azhar University, 2010

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Approval Sheet

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ABSTRACT

Ahmed Ali Aborawash Mohamed: Improving Fruit Quality of Crimson Seedless Grapes by Ethephon and Abscisic Acid Foliar Applications with New Spraying Machines. Unpublished Master's Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2022.

This study was conducted in two successive seasons 2017 and 2018 on 'Crimson Seedless' vines budded on Richter 110 rootstock at four years old, grown in a private orchard at Al Qattah, Giza Governorate, Egypt, to improving fruit quality, especially color. Using three Spray machines (1- Electrostatic ESS 2- Cima 3- Backpack sprayers) and three foliar applications concentrations (500, 1000 and 2000 ppm) from each two materials (Ethephon and Abscisic acid).

The experiment was laid out in a split plot design, the main plots were separated for Spray machines and the sub plots were split by materials type, so the experiment was consisted of eighteen treatments with for replicates, one tree for each replicate.

At veraison. Fruit quality, especially TSS/acid ratio and anthocyanin content were increased when spraying by Electrostatic ESS followed closely by Cima spray machines. 2000 ppm of Abscisic acid gave the significant highest values of Anthocyanin content followed by 1000 ppm ABA and 2000 ppm Ethephon, while there was no significant differential effect of them on TSS/acid ratio. On the other hand, the firmness decreased when spraying by 2000 ppm and 1000 ppm from Ethephon and Abscisic acid. Therefore, it can be recommended to get the best color and TSS/acid ratio for berries of Crimson seedless grape should be spraying 1000 ppm Abscisic acid or 2000 ppm Ethephon at veraison by Electrostatic ESS or Cima spray machines.

Keywords: Crimson seedless, Ethephon, Abscisic Acid, Foliar Applications, yield, Fruit quality and Spray machines.

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Table grapes in Egypt is considered one of the most important export crops, area of grapes in Egypt accomplished a noticeable increase reaching 174575 Feddan producing 1626259 tons while, the quantities exported during the 2019 season of Egyptian grapes were estimated about 154207 tons according to (F.A.O ,2019), crimson seedless cultivar is one of the late red grapes to be harvested in the season, it has a great taste, attractive shape, crunchy, and withstands long shipping. In colored grapes, berry color is one of the most important quality factors **(Nikolaou *et al*., 2003, Samaan and Nasser, 2020)**; However in the warm climates does not give adequate red color berries **(Celia *et al*., 2007).** The most important reason for this, may be due to in the warm regions high temperatures inhibit the accumulation of anthocyanins **(Spayd *et al*., 2002).** Crimson seedless growing in the San Francisco area in Brazil, clusters appear with uneven and poor red coloring, especially when harvested in October, during the hottest times of the year **(De Souza Leão *et al*., 2014).** Ethephon (2-Chloroethylphosphonic acid) is a plant growth regulator used to promote fruit ripening, abscission, flower induction, and other responses. Ethephon is similar in action to ethylene in its effects in enhancing color development and improving fruit quality characteristics of table grapes **(Cecilia *et al*., 2008, Samaan and Nasser, 2020).**

Grape's coloration is associated with anthocyanins, it's beginning to accumulate at veraison and seems to be regulated, partially, by abscisic acid (ABA) **(Ban *et al*., 2003 and Koyama *et al*., 2014).** Abscisic acid (ABA) is one of the "classical" plant hormones, i.e. discovered at least 50 years ago, that regulates many aspects of plant growth and development **(Finkelstein, 2013).** (ProTone®) provided by Valent Biosciences, USA, containing 10% of abscisic acid (S-ABA) this is using to improve color in grapes berries. The efficiency of foliar application process in grapes affects the quality and color of the clusters.

INTRODUCTION

To enhance application effect, different spraying systems and nozzle configurations are selected by adjusting system parameters. The nozzle type, position, angle, as well as system parameters including flow rate and application pressure, invariably affect spray characteristics such as the droplet sizes, velocity and spray swath **(Taylor *et al*.,2004 , Nuyttens *et al*., 2007 , Klein *et al*., 2009 and Samuel Appah *et al*., 2019).**

A spray application is most effective when the optimal droplet size for the intended target is utilized. In order to deliver optimal sprays, nozzle companies have developed innovations that aim to provide the greatest coverage per unit area. **(Ferguson 2016).** The smaller droplets may improve efficiency because they cover better, injure the target area less, and penetrate and translocate the active substance more. **(Prokop and Veverka 2003).** A significant amount of the chemical applied in many spray systems is wasted. To try to overcome this, some farms have resorted to using machines that reduce the wastage of spray solution, such as those that contain air induction nozzles. The air-filled droplets tended to explode and fracture into many smaller droplets, increasing the potential for spreading on the leaves **(Miller and Lane.1999, Świechowski *et al*., 2014).** Electrostatic spraying can provide a solution for these problems. Whereas Electrostatic spraying achieves more complete coverage of difficult targets than uncharged spraying in addition to minimizing wastage and environmental impact from over spray and spray drift. **(Al-Mamury *et al*., 2020)** Pneumatic spraying (CIMA) is a well-known technique for its fine droplet size generation.

This technique is very widespread, especially among large-farm vine growers in Europe and America whereas, the small droplets achieve a uniform target spray coverage **(Grella *et al*, 2020).**

The aim of this study was to improve quality properties of Crimson seedless grape vines, especially color, by spraying Ethephon and

INTRODUCTION

ABA through new Spraying machine types, named Cima SPA, and electrostatic spraying system (ESS) compared with the Backpack sprayer.