#### LEMBAR HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW* KARYA ILMIAH : JURNAL ILMIAH

Judul Karya Ilmiah (Artikel)	: Decitabine Self Monitoring in Quasi Systemaic review	Unstable Methylation Of DMNT Patiennts A			
Jumlah Penulis	: 3 orang				
Status Pengusul	: Peni Kistijani Samsuria; Indranila Kustarini Samsuria; Witjitra Darmana Samsuria				
Identitas Jurnal Ilmiah :	a. Nama Jurnal	: International Journal of Environmental & Agriculture Research (IJOEAR)			
	b. Nomor ISSN	: 2454-1850			
	c. Vol, Nomor, halaman	: Vol 5 Issue 9 p:29-35			
	d. Edisi	: September 2019			
	e. Penerbit	: AD Publication			
	f. Jumlah halaman	:7			
	g. DOI artikel (jika ada)	: https://dx.doi.org/10.5281/zenodo.3470698			
	h. Alamat web jurnal	https://ijoear.com/assets/articles_menuscripts/file/IJOEAR-SEP-2019-7.pdf			
	i. Terindeks di	: Google Schoolar			
	j. Online Turnitin	. https://doc-pak.undip.ac.id/4961/1/Turnitin_Decitabine_Self_Monitoring.pdf			
Kategori Publikasi Jurnal Ilm	iah : v Jurnal Ilmiah Intern	asional / Internasional Bereputasi **			
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ISSN 2454-1850

#### **International Journal**

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Volume-5, Issue-9, September 2019

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# Comparing the performance of a home-made bottle drip to a commercial drip system in the production of lettuce

(*Lactucasativa L.*) Dlamini M. V.<sup>1\*</sup>, Khumalo T.<sup>2</sup>

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**Abstract**— A study was conducted in which lettuce (Lactucasativa L.) was grown in a plot at the Faculty of Agriculture at Luyengo Campus of the University of Eswatini to compare three different irrigation methods on the production of marketable heads of lettuce. The performance of lettuce under a commercial drip tape was compared with a home-made bottle drip and a hand watering can as used typically by rural people in the country. The commercial drip had emitters discharging 2 liters per hour and therefore 2 liters per hour was applied with both the home-made bottle drip and the watering can during irrigation. The irrigation frequency was every after two days for all the treatments. The plot sizes were 1.5 m x 4.0 m and there were four replications per treatment. There were eighteen lettuce plants per plot. The lettuce was grown for a period of four weeks and then harvested whole. Yield parameters measured included the plant height (cm), leaf area index (LAI), root length (cm) and the fresh head mass (grams). Significant differences (P < 0.01) between treatments were obtained for fresh lettuce head mass and root length. The commercial drip treatment had largest fresh mass at 226.8 g. It was followed by bottle drip at 184.8 g. The control had the lowest yield at 165.3 g. There were no significant differences between treatments for plant height and leaf area index. It was concluded that the home-made bottle drip irrigation method could be recommended for rural people who cannot afford to buy the commercial drip system for the production of vegetables for household consumption.

Keywords— Lettuce, yield, drip, irrigation, water use efficiency.

#### I. INTRODUCTION

Eswatini import approximately 37,300 metric tonnes of fruits and vegetable with a value of US\$11,000,000 from South Africa (NAMBOARD, 2018). This is because the annual rainfall distribution in the country is skewed, with the most rainfall 1,500 mm received in the Highveld region and the least 450 mm in the Lowveld region. The Lowveld is the ideal place for vegetable production, but due to lack of water, rural communities struggle to make ends meet.

Crop production can only be a success if grown under irrigated conditions. However, the energy requirement associated with irrigation makes its adoption difficult. The adoption of low energy agricultural technologies like drip in the country is very low, as the Eswatini government tends to promote conventional methods of water resource development as opposed to micro irrigation which is ideally suited to small holder farmers (Manyatsi and Magongo, 2008). Drip irrigation can be more efficient than sprinkler and furrow irrigation (Hunsaker et. al., 2019) since only the root zone of the cropped area is irrigated (Dukes et. al., 2006 and Hartz, 1999). Many of the soils where vegetables are grown are sandy with very low water holding capacities. These require frequent irrigation and fertigation to minimize crop stress and to attain maximum production. The main drawback with drip systems is the frequent emitter blockages (Zhou et. al., 2019)

Although drip irrigation can be very efficient at 90 percent since water and nutrients are delivered to the crop root zone, the capital cost is beyond the reach of most rural farmers. Also, mismanagement can lead to over irrigation and excessive nutrient loss due to leaching. The beneficial effects of drip irrigation management compared to other forms of water management are attributed to a uniform water application (Sandhu et. al., 2019), controlled root zone development and better disease management since only the soil is wetted whereas the leaf surface stays dry (Holmer and Schnitzler, 1997).

Since the capital cost of drip irrigation is beyond the reach of many rural farmers (Westarp et. al., 2004) including Eswatini, the bottle drip system offers a feasible option for economic production in areas of low rainfall or during periods of water scarcity. Drip irrigation refers to any system of watering cultivated crops in which the water is delivered directly to each individual plant on a gradual and continuous basis (Bajracharya and Sharma, 2005). A bottle drip system is an easy way of watering plants (Darouich et al., 2014), no costs is involved in purchasing the bottles as old material is useful, no power or piping required to supply the water and it's very easy to make. The purpose of this study was to evaluate the effectiveness of

# Extraction and Evaluation of Chitosan Enhanced by *Lippia Multiflora* Oil Essential on Postharvest of Tomato

**Cissé Mohamed**<sup>1\*</sup>, Tia Vama Etienne<sup>2</sup>, N'guessan Amoin Elise<sup>3</sup>

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**Abstract**— Influence of chitosan and Lippia multiflora (Lm) essential oil used singly or combined was studied on postharvest tomato. Chitosan with 89.31% of DDA and solubility in acetic acid at 97.15 % was extracted from shrimp exoskeletons. Three concentrations of chitosan extracted (0.25; 0.5 and 1%) containing or not L. multiflora oil were used on Rhizopus stolonifer growth in vitro and in situ condition. In vitro condition, antifungal activity of the chitosan and Lm oil against R. stolonifer was conducted on agar media inoculated with fungal spores. Coating containing 1% chitosan incorporated with Lm efficiently inhibited fungal proliferation at 100% after 10 days. The antifungal effect of two molecules was effective when they were associated. In situ condition tomatos were coated with different solution. Antifungal effect and chemical parameters (pH and titrable acidity) were evaluated. Combination of Lm and 1% chitosan delayed efficiently R. stolonifer radial growth (2.1 mm) compared to uncoated fruit (70.37 mm) after 10 days of storage. Chitosan at 1% with or not Lm significantly reduced weight loss. Though, pH and total acidity (TA) were not influenced by coating solution.

Keywords— Chitosan, Lippia multiflora, essential oil, antifungal, Rhizopus stolonifer, tomato.

#### I. INTRODUCTION

Tomato (*Lycopersicon esculentum*) is the one of most popular consumed vegetables in Côte d'Ivoire because it is use in the composition of many dishes. However, due to its high-water content, intrinsically is likely to deteriorate rapidly during the postharvest handling. Rot disease caused by *Rhizopus stolonifer* is the most destructive disease of tomato [1, 2]. *R. stolonifer* is a good colonizer of plant debris and infects harvest fruits, often destroying the entire contents of a box within a few days by hydrolysis with tissue-macerating ability [3]. Over the past years, synthetic fungicides have been used to control this microorganism. However, it has been shown that some compounds used in these fungicides have caused strain resistance, representing a potential risk for the environment and human health [4]. Thus, there is a worldwide trend to explore natural products in order to reduce the use of synthetic fungicides, and options such as chitosan and plant extract have been evaluated.

Chitosan is a natural nontoxic biopolymer derived from partial or total deacetylation of chitin, a major component of the shells of crustacean such as crab, shrimp, and crawfish. In recent years, applications of chitosan to the fields of agriculture have received considerable attention [5-9]. The antifungal effect of chitosan has been observed against several fungi and its activity depends on its deacetylation degree, molecular weight and concentration [10-13]. Chitosan coating maintained the physico-chemical properties of fruits during conservation [14, 15]. By cons, chitosan is not a fungicide but rather a fungistatic [10]. Its effectiveness against fungi can be improved by adding natural antimicrobial substances vegetable. Essential oil of *Lippia. multiflora* can be incorporated in chitosan solution in order to strengthen the coating formulation. Indeed, essential oil of *L. multiflora* has been reported to exhibit a fungicidal [16, 17], a bactericidal and an insecticidal activity [18]. It has also been used to protect many fruits against fungi [19].

Use of *L. multiflora* to strengthen chitosan action against *Rhizopus stolonifer* can be an alternative way to inhibit this strains development and reduce the chemical substances use in food preservation. The purpose of the present work was designed to evaluate the effect of chitosan and *L. multiflora* singly or incombined treatments on the growth of tomato rot pathogens as well as their effect on physicochemical quality of tomato during its postharvest conservation.

#### II. MATERIALS AND METHODS

#### 2.1 Extraction of Essential oil (EO) of Lippia multiflora

Leaves of *Lippia multiflora* were collected in Dikodougou northern of Côte d'ivoire. Leaves were dried for 7 days protected away from the sun. After drying, 10 kg of leaves were used for the extraction of essential oil by steam distillation using a