

# GROWTH AND PHENOLIC CONSTITUENTS' PRODUCTION OF UKMR-2 ROSELLE IN RESPONSE TO SOIL MEDIA

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## INTRODUCTION

Numerous studies have shown the effect of dietary phenolics due to their anti-oxidative & possible anti-carcinogenic activities. Therefore, various studies related to environmental stress have the potential to enhance the production of anthocyanin (powerful antioxidants) without affecting other fruit quality attributes in roselle. Among environmental factors, soil nutrients clearly affect plant development. The effects of soil media on plant growth are much dependent on the relationship between air & water in the soil pores. Selection of the proper media components is critical to the success for plant growth (James & Michael 2009). Roselle will grow well on fertile soils but can also tolerate moderately fertile sandy & loamy soils. However, research on the impact of growth media on the production of secondary metabolites, especially on the phenolic compounds in UKMR-2 is still scarce.

## RESULTS & DISCUSSIONS

- The HPLC profiles, plant growth, phenolic constituents' & antioxidant activity in UKMR-2 calyces are shown in Figure 1, 2, 3 & Table 1.
- SM<sub>1</sub> plant growth parameters & percentage yield tend to be slightly higher compared with SM<sub>2</sub> treated plant. Furthermore, UKMR-2 cultivated on SM<sub>1</sub> showed a bit higher concentrations of anthocyanins, antioxidant activity, TPC & TAC.
- However, the different soil media ratio was found to have no significant influence on the growth & phenolic constituent production ( $p > 0.05$ ).
- According to Seghatoleslami et al. (2013) the non-significant change in plant growth showed that the stress was not severe enough to inhibit the growth of roselle stem cells.
- TPC & TAC on the SM<sub>1</sub> tended to be slightly higher from SM<sub>2</sub> may be due to the leaching of the nutrients since SM<sub>2</sub> contain more sand content. Soils with a high proportion of sand can drain easily & the nutrients easily washed through the soil (Azza et al. 2010).
- 2 predominant anthocyanins were detected in both media treatment and were identified as delphinidin-3-O-sambubioside (**peak 1**) & cyanidin-3-O-sambubioside (**peak 2**). No significant difference ( $p > 0.05$ ) was observed between the soil media and anthocyanin contents in UKMR-2.

## OBJECTIVES

To compare growth quality & phenolic constituents' production of roselle var. UKMR-2 in response to different soil media formulation ratio of topsoil, organic matter & sand.

## METHODS

### UKMR-2 cultivation:

- Soil Media 1 (SM<sub>1</sub>) - 2:1:1 v/v
- Soil Media 2 (SM<sub>2</sub>) - 2:1:2 v/v

**Growth Traits** - plant height, stem diameter, number of branches and leaves.

Calyces were harvested within 28-30 days after flowering

Air dried calyces were extracted in water (1 : 10 ratio)

Water extracts were dried with freeze dryer

**TPC** - Folin-Ciocalteu Assay Method

**TAC** - pH-differential Method

**Antioxidant** - DPPH Radical Scavenging Assay

**Quantitative** - HPLC Method

Plant Sample & Extraction  
Chemical Analysis

- The presence of both anthocyanins is in agreement with previous reports on other *H. sabdariffa* varieties worldwide (Kouakou et al. 2015; Bernal et al. 2016).
- In general, SM<sub>1</sub> (2:1:1 v/v) soil media may produce better growth, higher percentage yield & phenolic constituents' for UKMR-2 cultivation.

Table 1: Total phenolic, total anthocyanin contents and antioxidant activity in UKMR-2 from different soil media treatments

Media Treatment	TPC (mg GAE/g DW)	TAC (mg C <sub>3</sub> G/g DW)	IC <sub>50</sub> (mg/mL)
SM <sub>1</sub>	2.54 ± 0.34 <sup>a</sup>	8.06 ± 1.10 <sup>a</sup>	0.279 ± 0.501 <sup>a</sup>
SM <sub>2</sub>	2.45 ± 0.55 <sup>a</sup>	7.86 ± 2.09 <sup>a</sup>	0.294 ± 0.193 <sup>a</sup>

Values represent the mean value ± standard deviation, n = 6. Mean denoted by same letter indicate no significant differences between the treatments ( $p > 0.05$ ). DW, dry weight.

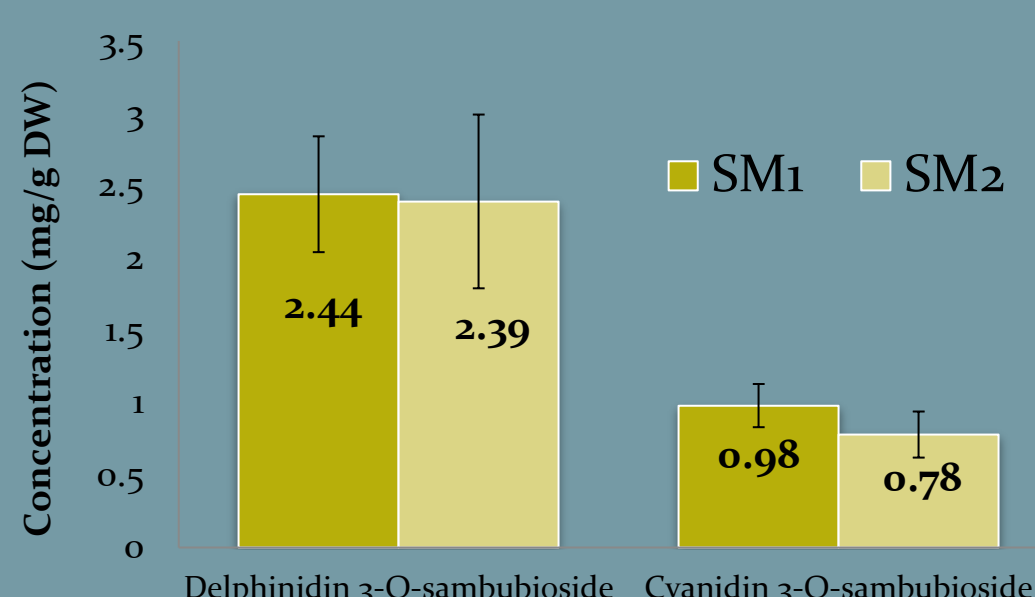


Figure 1. Anthocyanin compounds in UKMR-2 in different soil media

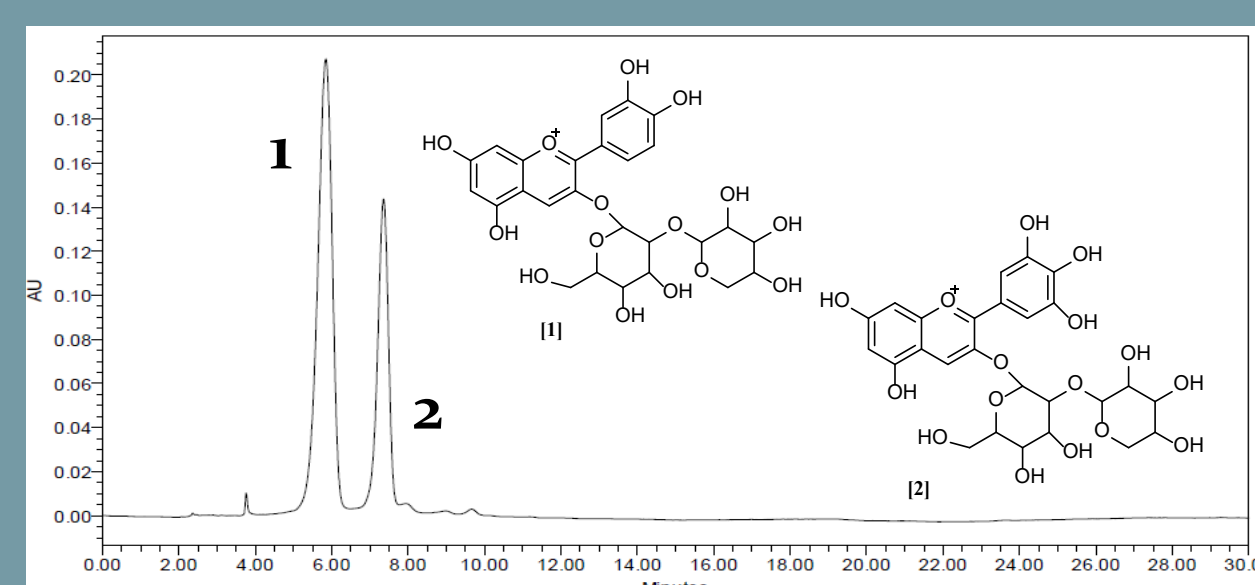


Figure 2. HPLC profiles representative of 2 anthocyanin in UKMR-2 calyces at 520 nm

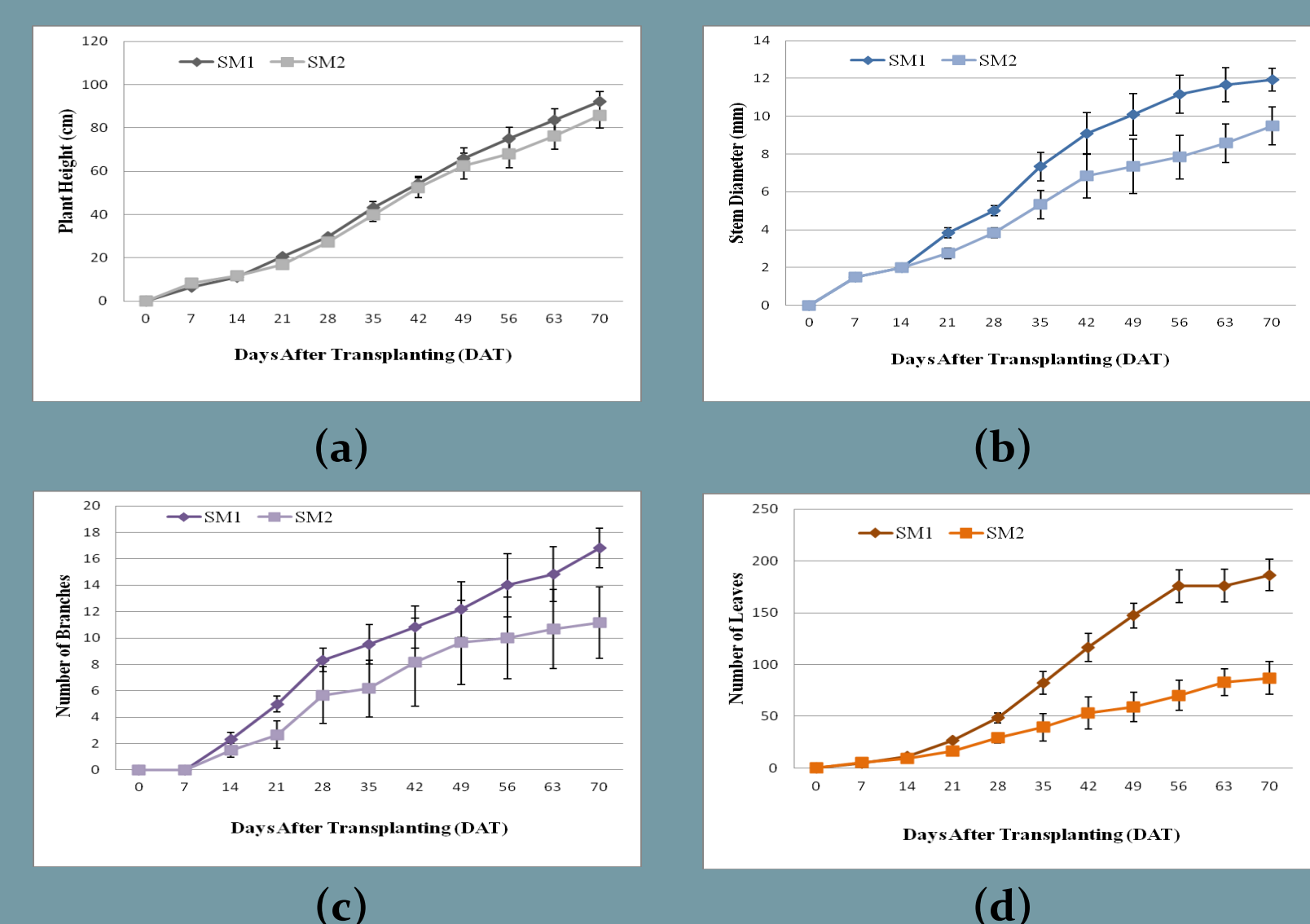


Figure 3. Effect of soil media treatment on plant growth; a) Plant height; b) Stem diameter; c) Number of branches and d) Number of leaves. Data points are means ± SD of biological replicates, n = 6.

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