



## Effect of Light and Temperature through Poly Film Covers on Anthocyanin Content in Rose Cut Flowers

G. Oloo-Abucheli<sup>1,2\*</sup>, J. N. Aguyoh<sup>3</sup> and G. Liu<sup>2</sup>

<sup>1</sup>Department of Plant Sciences, Chuka University, P.O.Box 109-60400, Chuka, Kenya.

<sup>2</sup>Department of Crops, Horticulture and Soil Sciences, Egerton University, P.O.Box 536, Egerton, Kenya.

<sup>3</sup>Department of Agriculture and Environmental Studies, Rongo University College, P.O.Box 1023-40404, Rongo, Kenya.

### **Authors' contributions**

*This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/IJPSS/2017/36238

#### Editor(s):

(1) Abigail Ogbonna, Department of Plant Science and Technology, Faculty of Natural Sciences, University of Jos, Nigeria.

#### Reviewers:

(1) Osamu Arakawa, Hirosaki University, Japan.

(2) Aashani Tillekaratne, University of Colombo, Sri Lanka.

(3) Lucas Cavalcante da Costa, Federal University of Viçosa, Brazil.

(4) Jianwei Gao, Institute of Vegetables and Flowers, Shandong Academy of Agricultural Sciences, China.

(5) Santosh Kumari, Indian Agricultural Research Institute, India.

(6) Hongjun Li, Beijing Forestry University, China.

Complete Peer review History: <http://www.sciencedomain.org/review-history/22014>

**Original Research Article**

**Received 19<sup>th</sup> August 2017**  
**Accepted 11<sup>th</sup> October 2017**  
**Published 22<sup>nd</sup> November 2017**

### **ABSTRACT**

Quality is the most important attribute in rose cut flowers for both export and domestic market. Quality in cut flowers may be defined by many attributes however, among the most important is colour. A group of pigments commonly known as anthocyanins determine colour in plants. Anthocyanins play a significant role by ameliorate the effect of high irradiance in plants under stressful environment. They also play a key role in delaying senescence hence enhancing the cut flower vase life. Despite the advantages anthocyanins are affected by the preharvest conditions mainly light and temperature interfering with their stability. An experiment was set up to investigate the effect of light and temperature through selected coloured poly film covers on rose petal

\*Corresponding author: E-mail: [opetugrace@yahoo.co.uk](mailto:opetugrace@yahoo.co.uk);

anthocyanin content. The greenhouse structure was covered by poly films of different colours that were compartmentalized i.e. UV-A clear, IR504 with yellow tint and UV-A 205/N with green tint replicated three times. Two rose cultivars Red calypso and Furiosa were established and maintained, upon maturity the flower heads were plucked and oven dried at 60°C to constant weight. 5 g of the crushed petals was used in anthocyanin extraction. The anthocyanins were extracted and quantified in comparison with commercial standards using HPLC machine. The data obtained from the chromatogram as peak areas was subjected to analysis of variance (ANOVA) using SAS statistical package (SAS Inst., Inc., Cary, NC) at  $P = .05$ . Where there were treatment differences, mean separation was done using Tukey's procedure. Poly films significantly affected the quantity and quality of anthocyanin accumulation in rose petals. Cyanidin 3-O-glucoside was the most prevalent anthocyanin across all poly film covers and it was noted to be high under the UV-A 205/N ( $110.95 \pm 8.26 \mu\text{g} \cdot \text{g}^{-1} \text{DW}$ ) and IR504 ( $109.69 \pm 8.26 \mu\text{g} \cdot \text{g}^{-1} \text{DW}$ ) compared to UV-A clear ( $84.56 \pm 8.26 \mu\text{g} \cdot \text{g}^{-1} \text{DW}$ ). The quantity of anthocyanins was low under the UV-A clear poly film that was characterized by high light transmission and day temperature. Combination of high irradiance and temperature affect the quality and quantity of anthocyanin in rose cut flowers.

*Keywords: Rose cultivars; temperature; light; anthocyanin; poly film.*

## 1. INTRODUCTION

Light affects productivity and quality of ornamental plants besides growth and development. Plants response to light is influenced by the fluctuating environmental conditions and more so light properties like duration, intensity and quality [1] Plant growth attributes such as height, leaf area and leaf length decrease in response to UV-B radiation [2]. Red and far red wave band influence the phytochrome pigment which initiates photomorphogenic changes in plants [3]. This wave band varies from one poly film to the other depending on colour and gauge. Previous studies have shown that absorption of the far-red light of the poly films increase with the concentration of the dye [4,5,2]. Intensity of light in the far-red region affects morphological plant responses [6] which may have positive or negative impact on the physiochemical processes of the plants. Depending on the quality of light transmitted plant quality may be jeopardized affecting the colour of the flowers.

Anthocyanin content in cut flowers is affected by pre- harvest conditions to which the plant is subjected. A wide range of colours is not only insured by substrates accumulation but also other factors such as co-pigments, vacuole pH and cell shape [7]. Environmental factors such as elevated temperature received during growth reduce anthocyanin content of flower petals [8]. In other studies, it has been argued that plant growth and development is determined by the genomic characteristics of the plant that affect fundamental components like the flower colour [9]. Depending on the changes that occur during

biosynthesis different molecules are formed resulting to diverse types of anthocyanins.

Peonidin type of anthocyanins is biosynthesized from cyanidin, while petunidin and malvidin are biosynthesized from delphinidin type of anthocyanins [10]. Anthocyanin produced varies from one species to another depending on their genetic constitution. Anthocyanin stability and catabolism is quite dynamic and its concentration in plants is bound to vary from time to time [11]. Rose and carnation the major cut flowers for example are only able to produce anthocyanin based on pelargonidin and cyanidin. Cut flower consumers may prefer rose stem in which the leaves have deep green colour that blends well with other hues of the bloom. Therefore, it is important to study and maintain all factors that will enhance flower colour.

## 2. MATERIALS AND METHODS

### 2.1 Experimental Layout and Crop Establishment

The research was carried out under a split plot experiment laid down in a completely randomized block design. The main treatment involved poly film covers with different colours denoted as; G0 = UV-A clear (control), G1= IR 504 (green tint) and G2 = UV- A 205/N (Yellow tint) of similar gauge 200 microns. The greenhouse was divided into three sections of  $44\text{M}^2$ . Each section was covered with a different poly film cover as described above and replicated three times. Two rose cultivars; Red calypso and Furiosa were established and maintained till maturity for data collection.