Rubber yield can be manipulated, and often increased, by environmental and hormonal methods as proven in Hevea brasiliensis, the world’s main rubber producing plant. However, similar efforts can be implemented on an alternative rubber plant, Taraxacum kok-saghyz (TK), where even slight gains in yield are beneficial towards its commercialization. This study aims to identify methods of applying abiotic stress on TK to improve rubber yield. Physiological and environmental factors will be tested on the plants, including light quality; cold induction using a hydroponics system and manipulation of the hormone ethylene via the use of ethephon. The treatment effects were monitored by analyte quantification using Accelerated Solvent Extraction (ASE) as well as by microscopy. The findings indicate that rubber increased with these different physiological and environmental approaches. Supplemental lights doubled rubber with 14.2±4.3 mg dry rubber/root whereas the plants in the natural light treatment had 5.7±1.4 mg/root. After 50 days, cold treated plants had significantly higher rubber per root with 325.5±50.0 mg/root in comparison to the distilled water control level of 50.7±4.4 mg/root. Furthermore, a histological study shows cellular changes in the cytoplasm and a production of morphologically distinct rubber particles under when the stress conditions. Overall, these studies are providing valuable information on abiotic stresses on TK rubber biosynthesis which can be adapted into the agronomic practices of this crop.

**RESULTS AND DISCUSSION**

**SUPPLEMENTAL LIGHT**

Rubber yield can be manipulated, and often increased, by environmental and hormonal methods as proven in Hevea brasiliensis, the world’s main rubber producing plant. However, similar efforts can be implemented on an alternative rubber plant, Taraxacum kok-saghyz (TK), where even slight gains in yield are beneficial towards its commercialization. This study aims to identify methods of applying abiotic stress on TK to improve rubber yield. Physiological and environmental factors will be tested on the plants, including light quality; cold induction using a hydroponics system and manipulation of the hormone ethylene via the use of ethephon. The treatment effects were monitored by analyte quantification using Accelerated Solvent Extraction (ASE) as well as by microscopy. The findings indicate that rubber increased with these different physiological and environmental approaches. Supplemental lights doubled rubber with 14.2±4.3 mg dry rubber/root whereas the plants in the natural light treatment had 5.7±1.4 mg/root. After 50 days, cold treated plants had significantly higher rubber per root with 325.5±50.0 mg/root in comparison to the distilled water control level of 50.7±4.4 mg/root. Furthermore, a histological study shows cellular changes in the cytoplasm and a production of morphologically distinct rubber particles under when the stress conditions. Overall, these studies are providing valuable information on abiotic stresses on TK rubber biosynthesis which can be adapted into the agronomic practices of this crop.

**INTRODUCTION**

**Taraxacum kok-saghyz** (TK) is currently being developed as a commercial crop in the US and Europe (Buranov and Elmuradov, 2010; Cornish et al., 2013) and is an alternative for Hevea, the tree that produce rubber industrially. As TK is still at its early stage of plant domestication and commercialization, methods are needed to maximize rubber production especially through its horticultural and agronomic practices. Recently a series of studies were conducted with the objectives to identify possible environmental or chemical means as an abiotic stresses that can be used to improve rubber yield in TK and can be implemented as horticultural/agronomic and post-harvest practices. In these studies, supplemental light, cold induction and ethylene application via the use of ethephon (ET) were evaluated as an effort to provide information of abiotic stress effects on TK rubber biosynthesis.

**MATERIALS AND METHODS**

The supplemental light study involves the use of LED lights on hydroponically-grown TK. Clonal planting material was used and grown using nutrient film technique (NFT) under 16-hour exposure of LED lights and were compared with natural light exposure in summer 2015. The plants were harvested after 2 and 3 months with the photosynthesis rates were monitored and recorded using LI-COR (LI-6400) equipment. Meanwhile for the cold induction study, clonal planting material from a single plant was grown with NFT systems as well. After 4 months, cold temperature (10 ± 2°C) was introduced by using chillers. The plants were harvested after 20 and 50 days of ET experiment, one-year old TK plants were harvested and the roots were soaked in four different treatments: distilled water (control) or 1% ET at either ambient temperature or 4°C. After 9 days, the roots were harvested for analysis. Analytes quantification was used in all three experiments by quantifying inulin, resin and rubber content with accelerated solvent extraction (ASE) (Pearson et al., 2013). Latex quantification (LQ) (Cornish et al., 1999) and PENRA III method which used enzymatic process were carried out as well. For microscopy study, samples were fixed, dehydrated and resin-infiltrated before being sectioned, stained and viewed under a TEM microscope (Hitachi H-7700).

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