



**THE EFFECT OF L-CITRULLINE IN WATERMELON DRINK ON
CARDIOVASCULAR ENDURANCE PERFORMANCE AMONG
ULTIMATE FRISBEE ATHLETES**

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ABSTRACT

Introduction: Citrulline has been proposed as an ergogenic aid. Watermelon contains high in L-Citrulline concentration that show benefits to sport performance. *Purpose:* To investigate the effect of L-Citrulline in watermelon drink on cardiovascular endurance and in reducing muscle pain among ultimate frisbee athletes. *Methods:* This study involved a total of thirteen (N=13) of ultimate frisbee athletes from Universiti Teknologi MARA Sarawak (UiTM). Only 1 group that involved and using a convenience sampling method. Before the test, subjects were attending the familiarization phase three days before pre-test. The cardiovascular endurance performance was measured using Yo-Yo Intermittent Recovery Test 1, and the muscle pain rating scale was measured by using Visual Analog Scale (VAS). One-week after wash out period was given to the subjects as recovery time. Watermelon drinks was ingested to all subjects 1 hour before the post-test session and Visual Analog Scale (VAS) given after 24 hours. *Results:* Results of the current findings shows that there was an improvement on the effect of L-Citrulline in watermelon drink on cardiovascular endurance (13.53 ± 0.70) and reducing muscle pain (1.23 ± 0.443) with significant value ($p < 0.05$). *Conclusion:* The results show that, L-Citrulline drinks was proven improved the performance and reduce muscle pain among ultimate frisbee athletes.

Keywords: *Watermelon, L-Citrulline, Citrulline, Endurance, Ultimate frisbee*

CHAPTER 1

INTRODUCTION

1.1. BACKGROUND OF THE STUDY

Citrulline is a non-essential amino acid identified from the juice of watermelon (Akashi, Miyake & Yokota., 2001). Watermelon is among the most valuable horticultural crops in the world and is also a healthy fruit due to its high lycopene content (Food and Agriculture Organization., 1989). The lycopene content in commercial watermelon has been reported to be 45.1-53.2 mg/kg fresh weight (Heinonen, Ollilainen, Linkola, Varo & Koivistoinen., 1989; Tee and Lim, 1991; Mangels., Holden., Beecher., Forman & Lanza., 1993).

According to FAO (1989), watermelon or in its scientific name also known as *Citrullus Lanatus* is the family of *Cucurbitaceae* is a rather popular fruit among Malaysians. Watermelon is probably introduced into Peninsular Malaysia by the early Indian and Chinese merchants in the 14th century (Salleh, 1986). According to Snowdon (1990), watermelon is a warm-season crop and is grown worldwide usually in regions that have along warm growing season. The fruits are very juicy with a moisture content of over 90% of water. Anon (2008) stated that, although watermelons are not a rich sources of vitamin C, the level of this nutrient in the fruit comparable to imported pears and grapes but the red of flesh watermelon also contains some vitamin A.

The American College of Sports Medicine (2009), defines aerobic exercise as any activity that use large muscle groups and can be maintained continuously also

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION OF WATERMELON

There are two types of watermelon which were seeded watermelons have dark brown or black oval seeds, whereas seedless varieties may contain no seeds at all or only very small and thin, jelly-like white seeds (Salleh, 1986). The colour of the flesh varies from yellow, orange, pink, or red in most commercial varieties (Rushing, 2004).

According to Avgi Soteriadou (1969), the drying of the tendril at the point of attachment the fruit stem to vine is also considered a sign of maturity. The colour of that part of the fruit that touches the ground, which takes a yellow tinge as maturity approaches (Snowdon, 1990). High quality watermelon should have a sugar content (measured as soluble solid) of 10 percent or more in the flesh near the center of the watermelon (William, 1999).

Maturity standards for melons, grape and citrus are often based on the level of soluble solids (Wills, Lee, Graham, McGlasson & Hall., 1989). According to Maynard (2001), "sweetness" one of the prime quality factors in watermelon fruit is related to total soluble solids (TSS). Picha (1988) stated that the soluble solids contents of watermelon declined after storage for 19 days at 23°C.

The low titratable acidity was consistent with fruits which show that the watermelons did not acquire a sour taste during storage (Azudin, Augustine, Azizah & Suhaila., 1989). This is due to the watermelon is considered as non-climateric fruit as reported by (Salman-Minkov & Trebitsh., 2008), acid content does not increase further