



## Abstract

# Acute Evening Consumption of Green Kiwifruit in Young Men Enhances Waking Alertness, Mood and Increases 5-Hydroxyindoleacetic Acid in Urine <sup>†</sup>

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**Abstract:** Emerging evidence suggests that consuming two New Zealand green kiwifruit (*Actinidia deliciosa* cv. *Hayward*) daily for four weeks may improve sleep quality. The subjective and objective acute responses and underlying physiological responses are unknown. The current study aimed to investigate the acute effects of fresh and dried green kiwifruit compared to a water control on sleep quality and mood measures, and concentration of urinary serotonin and melatonin metabolites. In a randomised, single-blind crossover study, 24 men (age:  $29 \pm 1$  years old, body mass index (BMI):  $24 \pm 1$  kg/m<sup>2</sup>) with either poor or good sleep quality were recruited. They consumed an evening standardised meal with one of three treatments; (i) two fresh green kiwifruit (without skin); (ii) 32 g dried green kiwifruit powder (including the skin; equivalent to two fresh fruit) mixed with water; or (iii) a water control, on three separate nights separated by 6–8 days. The subjective (Leeds Sleep Evaluation Questionnaire, Stanford sleepiness scale) and objective (actigraphy) sleep quality, mood (profile of mood states), and 5-Hydroxyindoleacetic acid [5-HIAA] and 6-Sulfatoxymelatonin concentrations in morning urine were determined. In poor sleepers, ease of awakening improved 24% after dried kiwifruit ( $p = 0.005$ ) and trended to improve after fresh kiwifruit ( $p = 0.052$ ), compared to the control. Good sleepers trended towards improved ratings of getting to sleep with fresh kiwifruit ( $p = 0.053$ ) and no improvement after dried ( $p > 0.1$ ) compared to control. Regardless of sleeper type, compared to control, both fresh and dried kiwifruit treatments trended ( $p < 0.1$ ) toward improved esteem and total mood disturbances. Furthermore, after dried kiwifruit, ratings of morning alertness ( $p = 0.012$ ), behaviour following waking and vigour were higher ( $p < 0.05$ ) compared to control. Both kiwifruit treatments increased urinary concentrations of the serotonin metabolite 5-HIAA ( $+1.56 \pm 0.4$  ng/g (fresh)  $p = 0.001$ ,  $+1.30 \pm 0.4$  ng/g (dried)  $p = 0.004$ ) compared to the control ( $4.32 \pm 0.4$  ng/g). This study is the first to demonstrate that a single evening intake of kiwifruit improves aspects of sleep quality and mood.

**Keywords:** kiwifruit; sleep quality; mood; serotonin



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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Data available on request from the authors.

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